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[From the Buffalo Courier, August 23.]

The Buffalo Water Works.

THE BIDS FOR THE NEW PUMPING MACHINERY—THE PLANS AT THE OFFICE OF THE WATER COMMISSIONERS—THE DIFFICULTY IN THE NEW TUNNEL.

By direction of the Common Council, the Board of Water Commissioners advertised on the 6th of August for plans for a set of pumping machinery of sufficient capacity to pump into the reservoir at least 10,000,000 gallons of water each twenty-four hours; the maximum head or lift being ninety feet. These plans were to be received until August 21st, and yesterday the four which were received were opened by the Commissioners. The accompanying drawings can be seen at their office by any persons who are interested.

Hubbard & Whittaker, of the Borden Iron Works, Brooklyn, offer one of their patent pumping engines, of the required power. Their price for engine, boilers, pumps, etc., delivered and set up is $80,000. With this they guarantee to raise 80,000,000 pounds of water one foot high for every hundred weight of coal used. For every million pounds of duty above 80,000,000 pounds, they require $1000 extra, and for every million pounds below that figure they will allow $1000. This machinery they agree to put up within six months from the date of the contract.

Henry R. Worthington, of the Hydraulic Works, No. 59 Beekman street, New York, offers to build a first-class compound cylinder, condensing and expanding, duplex pumping engine, guaranteed to answer the requirements of the contract in every respect, for $48,250. He will furnish full plans for masonry, foundations, etc., and will, if necessary, build these, for $2,700. He will furnish the necessary boilers for $9,500, and will put up his machinery at the works in one year from the date of the contract.

The Holly Manufacturing Company, Lockport, offer to furnish one set of pumping machinery, of the required capacity, for $45,000. The machinery to consist of two pairs of double cylinder, quarter crank, variable cut-off, condensing steam engines, mounted on a heavy iron arched frame; also four double-acting pumping engines; also one Holly's patent hydrostatic water supply regulator and Holly's patent variable steam cut-off; also an air-pump and condenser; also steam water pressure and vacuum gauges. They agree to set up the machinery before April 1st, 1873.

The only Buffalo bidder is David Bell, who offers, for $85,000, a condensing beam engine, with double-acting force pump, and agrees to place engine and boilers in a prepared foundation, within one year from the date of the contract. Or he will construct a multiplicity of cylinders and pumps of the requisite capacity for $80,000.

The commissioners have not yet decided which of the above plans to accept.

THE DIFFICULTY AT THE TUNNEL.

A communication sent to the council by the city engineer last Monday, brought to public attention the fact that a difficulty had been encountered in the construction of the water works tunnel under Niagara river, for which Messrs. Clark and Douglas are the contractors. That communication was printed in the COURIER, but while it accomplished the purpose designed, it did not contain as full an explanation of the difficulty as will be of public interest. The facts, in brief, are these, as we understand them. The original contract of the city with Messrs. Clarke & Douglas was for the construction of 700 feet of tunnel. After this work had been finished, the tunnel was thought not long enough, and 300 feet additional were contracted for, with the same parties, at the round sum of $400,000. Of this addition 170 feet are finished, and the tunnel is now 870 feet long, and was completed to that distance July 20th. At that date a stream of water was struck at the bottom of the tunnel, so great as to exceed the power of the pumps to use. Additional pumping power was called into requisition, and was successful in keeping the tunnel clear of water; but experts coincided in the opinion that a large fissure in the rock had been reached, and that another blast would almost certainly be fatal to the entire work. The council, therefore, on the recommendation of the engineer, directed the tunnel to be walled up at the point to which it is now finished, and it will be carried no further.

We hear no difference of opinion expressed as to the fact that as good water can be obtained at the present terminus of the tunnel as 150 feet further out, and the casualty will probably benefit the city by saving to it thirteen-thirtieths of $100,000, as the equitable adjustment would seem to be to pay the contractors in proportion to the amount of work done The inability to finish it is no fault of theirs, and will be no serious detriment to them. Great difficulty was experienced in locating above water the terminus of the proposed tunnel of 1000 feet, in order to put down mooring cribs up stream, from which to build a pier. This work will have to be commenced *de novo* for the shortened tunnel, and we presume that there is small chance that the benefit to be derived from procuring our water supply from near the center of the river, can be realized this season. We are confident, however, that Clarke and Douglas will accomplish all that energy can accomplish.

ALLOY SUITED for soldering steel and iron to brass.—Take three parts of tin, 39½ of copper, and 7½ of zinc. It is stated, by this alloy, in molten state, steel and iron, as well as these and brass, can be so joined together as to prevent any breakage.

Northwestern Pennsylvania Coals.

BY DR. R. P. STEVENS.

[We extract the following passage from an extremely interesting article in the *Coal and Iron Record*, entiled "New Railroads to the Coal Fields." The author will be recognized as a valued contributor to these columns.—ED.]

The anatomy of the strata is very interesting. In the upper portion of the Devonian, and near the base of the hills, lies a stratum of oxide of iron ore, and near to it a stratum of impure fossiliferous limestone. This limestone is full of fossils of the genus spirifer, and by this means can be identified through a great extent of country. The ore is a peroxide of iron, yielding 35 per cent. of metallic iron.

Ascending the hills, the next stratum of economic wealth is one of bituminous shale, which has once been and may be again of value, for distillation of paraffine oils.

The lowest bed of coal often puts on a lamelliform appearance, resembling the famous block coal of the Mahoning and Wabash valleys. No extensive bed has yet been opened. Above these shales comes in a nodular ore, and then sometimes a bed of black-band ore, yielding by analysis 43 per cent. of metallic iron.

The lower workable bed of coal yet opened in this horizon makes its appearance, and 16 to 30 feet above appears a third bed of coal, which is often a double vein—that is, it has a division generally about one foot from the bottom, of a few inches in width, of shale or clay. In this neighborhood there is another bed of iron ore (argillaceous carbonate) which gives 34 per cent. of metallic iron. Above this comes in another bed of coal, and then the fossiliferous limestone, which marks the division line between the lower and middle series of coals, according to Prof. H. D. Rogers. McKean County, then, holds all the coals of the low series. As gas-generating coals, these rank with the highest of the State. They are remarkably free from sulphur, whether the sulphur appears as sulphuret of iron, or is molecularly mixed with the coal. Many of the coals are also good for coke; and as steam-generating coals for locomotives, they compare favorably with any in the country. The hills of this county hold four good seams of coal, probably five of iron ore, two of limestone, one yielding 94 per cent of lime, several seams of fire-clay, good sandstone for furnace building, and clays for cements; and when we consider that soon, in point of facilities for cheap transportation, this region will be unrivalled, we may safely predict that it will become a favorite location for furnaces and iron mills.

Within 30 miles of mineral fuel, canal-boats can be loaded with the products of these hills—ore, fuel, or lumber—and proceed to Albany and even to Lake Champlain, and reloading with the magnetic ores of

Champlain, or dyestone ore of Oneida and the Erie Canal, return to the original port of its voyage, bearing full burdens each way, and without the usual extra cost of rehandling. There is not another region in the United States where the magnetic and red hematites can meet with the argillaceous and carbonates of iron, with fuel and fluxes for reduction, as in McKean County, and on the line of the Rochester, Nunda, and Pennsylvania Railroad.

Chemical Repertory.

No. 76.—September 16, 1872.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

445. Water from Steam Engine Condensers.—MM. Cail & Co.—The authors first refer to the various methods now in use for purifying—that is to say, freeing from grease and oily matters—the condensed steam of the low pressure engines, so as to render the resulting water fit for use again as feed-water of the boilers. They next describe their invention, which mainly consists of a contrivance by which the water is agitated with benzine (light petroleum oil) which dissolves the fatty matters, leaving the water in a pure state. The benzine may be rendered, after having become saturated with fatty matters, fit for renewed use by distillation, while the fatty substances may be used for soap making and other purposes. From the author's experiments it appears that from 1-5th to 1 grm. of fatty matters per horse power is daily taken up by the condensation water: benzine of good quality can take up more than half its weight of fatty matters before becoming inactive; other liquid hydrocarbons may also be used.—*French Journal.*

446. Search for New Coal Fields in England.—The scarcity and consequent dearness of coal still continues to be a question of absorbing interest in England. To carry "coals to Newcastle" so far from conveying an idea of superfluous supply, seems to be now becoming a reality and necessity, when we find coals among the exports from Belgium to England. Alive to the crisis that is upon them, the people are already taking active steps to meet the difficulty and increase their supply of coal. At the forthcoming meeting at Brighton of the British Association for the Advancement of Science it is intended to pierce the Wealden strata, in order to ascertain what lies beneath. A point has already been selected, called "Councillor's Wood," where engineers are immediately proceeding to work, and where, from all the geological manifestations, it is confidently expected that a large supply of the valuable mineral will be met with. Coals are now so dear in England, especially in the southwest portions of it, that the opening of any new fields of extent in those districts would be a national blessing.—*Exchange.*

447. Will it Come to This Yet?—Americans may glean both instruction and amusement from the following correspondence in the London *Mining Journal*:

Sir: We are threatened (at least) with coal to rise to £3 per ton during the coming winter months in London. Welsh coal is to cost householders this price, if not more. Now, what we require in our houses, is a coal that will cook the dinner, and give some warmth. I speak of the masses generally. In Pennsylvania and other States of America we hear of unlimited coal fields as large as the area of England herself, and I believe recently discovered. Nothing prevents our active-minded enterprising cousins from importing Coolie labor into the coal districts in question to work the vast mines. The cost of labor will be nominal. I have visited the far east and west myself, and am pretty well acquainted with the labor markets. It has been stated that this coal can be landed in England at from 13s. to 15s. per ton net. These abominable strikes would thus receive a salutary check, and bring a just retribution on the extortioners themselves.

The best coal would only be required by steam engines, railways, and steam vessels—the two latter must raise their fares for a time; but less coal will be required, and the men caught in their own net. Undoubtedly inferior coal in the parlor is objectionable, and chokes the grate with dust. Perhaps, however, some of your enlightened readers can tell us more about this American coal and its merits. Some have praised it. The matter, however, needs immediate consideration, and public attention. Americans may peruse this letter, and see an immediate fortune at hand. I hope so for our sake, especially for the poor in our great cities. H. P. B.

Truro, July 25, 1872.

448. Snow as a Non-Conductor.—Mr. G. G. Prindle, of Chittenden county, Vermont, has made an experiment designed to ascertain how far soil is protected from cold by snow. For four successive winter days, there being four inches of snow on a level, he found the average temperature, immediately above the snow, 13 deg. below zero; immediately beneath, 19 deg. above zero; under a drift two feet deep, 27 deg. above zero.

449. Effect of Gas on Trees.—Some recent experiments have been made at Berlin to ascertain the effect which gas has on trees, the roots of which are exposed to its influence. Three trees were chosen for this purpose—two limes and a maple. The gas was conveyed in subterranean tubes to within three or four feet of each tree, and was dispersed into the soil by holes furnished by brass gratings, to obviate the obstruction of the pipes. At the end of two months the roots were uncovered, and all the small fibers were found to be dead. The bark of the strongest roots were rotten, and even the body part changed. After two months and ten days the gas was cut off to see if the trees would recover. The maple showed no signs of life, but one of the limes again became covered with leaves, but bore evidences of ill health. The poison manifested itself more rapidly in that part of the earth which remained compact. These experiments followed up during a year, leave no doubt as to the danger to which trees are subjected when exposed to infiltrations of gas near the roots.

450. Vegetable Hair Dye.—As most of the mineral and metallic hair dyes in common use, are deemed poisonous, the following from the *Scientific American*, may be acceptable to some:

"Among organic dyes which can be prepared by any one is that obtained from the green walnut burr, the epicarp of the fruit of the *juglans regia*. For this purpose the burrs are soaked in water and pressed. The liquid thus obtained is then evaporated and the dye precipitated as a black powder, which can be used in any convenient form of hair dressing. Dr. Kurtz says that large quantities are used in Greece, and are also exported thence for this purpose. The Greeks also make a dye by adding alum to the expressed juice, and use this to give a dark and marketable color to the cattle exported to Marseilles and other places where light colored stock is at a discount.

451. New Voltaic Batteries.—The number of these is becoming legion. We clip two recent items. The first from the London *Mining Journal*:

"New Electric Pile.—At the Academie des Sciences M. Gaiffe sent in a description of a new electric pile, much cheaper than those in use. The couple he has adopted consists of a rod of lead and another of zinc dipping into a vessel at the bottom of which there is a layer of minium. The leaden rod goes quite to the bottom; the zinc one only half way. The electro-motive force of this pile is about one-third that of Bunsen's; but it is very constant in its action, and the expense when the circuit is opened is scarcely appreciable."

The second from the *Chemical News*:

"Sir: It may interest your readers to know that the following cheap and simple battery is nearly 50 per cent. higher in potential than a Grove or Bunsen, and fully 150 per cent. higher than a Daniell.

"For negative, carbon packed in granulated carbon, peroxide of manganese, and precipitated sulphur; the liquid should be dilute acid—sulphuric is best. For positive, zinc in caustic potash or soda.

"The potential is higher than any I know, excepting, of course, those which have magnesium, sodium, or potassium for positives.

"The internal resistance is rather large; if common salt or chloride of potassium be used instead of caustic alkali, the internal resistance is much less, but the potential sinks to a little more than 10 per cent. higher than a Grove. With dilute sulphuric acid on both sides, the resistance is still less, but the potential is only a little higher than a Grove.

"I am, etc., H. Highton."

452. German Coal Mines.—It appears that divers are now employed in these mines frequently; diving apparatus coming more and more into regular use, and following the example of Westphalia, a number of foremen, pitmen, and miners are now being drilled in its use in the Saarbrucken coal district, at the mine Friedrichsthal. The men learn first the construction of the apparatus and its use in a pond, under a head of about twelve feet of water: they then continue their drill in a shaft about twelve fathoms under water, where they go up and down on ladders or hemp ropes, and work under water, taking out and replacing valves, and other pieces of pumps, packing pistons, etc. They also learn to move and work in suffocating gases, such as invariably follow explosions of fire-damp. Over forty men have thus been drilled and made ready for an emergency.—*Engineering.*

453. Benzoic Acid in Gas Liquor.—According to Reinsch, on treating gas liquor with sulphate of lime at a temperature of 50 deg. C., the carbonate of ammonia in the liquor is completely decomposed, with evolution of carbonic acid and formation of a yellowish solution of sulphate of ammonia, smelling strongly of tar. The tarry constituents are not easily separated from the salts of ammonia. If, however, the solution is dried at a moderate heat till no more aqueous vapors are given off, and the residue is then heated in a porcelain capsule covered over with a plate of mica, the mass assumes first a rose color, then a purple red, whilst the mica is coated over with benzoic acid in shining crystalline needles. Over this crust is a tender, woolly sublimate, consisting of sal ammoniac and sulphate of ammonia. If the residue is treated with water and filtered, we obtain a colorless solution of sulphate of ammonia, and on the filter remains an aniline brown coloring body.—*Scientific American.*

454. A Water Blower.—A contrivance that has been erected at a foundry is worthy of notice. At present it is only used for blowing the ordinary blacksmith's fire, but eventually it will, no doubt, be used for the smelting furnace. It consists of an empty barrel, or quarter cask, stood on end behind the fire, to the centre of which a blast-pipe, from two to three inches in diameter, is fixed. On the top of the cask is another pipe, the same size as the blast-pipe, some six feet in height, with a funnel-shaped top. Just above this there is a horizontal water-pipe of the ordinary service size, with a nozzle, having an aperture of one-eighth inch in diameter, fixed at right angles: that is, pointing down the pipe leading to the barrel, down which there rushes, with considerable force, a tiny jet of water, which causes a rush through the blast-pipe that is far superior, both in power and steadiness, to any that can be obtained from the common blacksmith's bellows. The waste-water, which is very limited in quantity, escapes through a pipe, attached for the purpose, to the bottom of the barrel.—*Coal and Iron Record.*

455. Regelation.—A beautiful experiment, showing the regelation of ice, may be made by supporting the ends of a large block of ice, and pas ing around it, in the middle, a piece of wire about one-tenth of an inch in thickness, to the lower part of which a fifty-six pound weight is hung. The wire will be gradually pulled through the ice, cutting a groove of its own diameter, until it passes entirely through, and the weight falls upon the floor. But, although the plane of passage through the ice is plainly marked, the block is not divided, and after the wire has cut entirely through the mass, it cannot be split in this place with a knife or chisel. Although the ice in immediate contact with the wire is melted by the pressure, it is im-

mediately regealed, and acquires the same firmness and tenacity as if nothing had forced it asunder. This experiment has been tried by Prof. Bottomley, of Glasgow University, and also by Prof. Tyndall, in his admirable lectures. The theory of regelation, which was first proposed, we believe, by Thomson, has a very important bearing upon the phenomena of glacial movements, and has been thoroughly investigated by Tyndall in his studies regarding the movements of the well known Alpine glaciers.—*Amer. Exchange and Review.*

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456. Iron Ores and Phosphorus.—Lowthian Bell, in his recent work, on the "Chemistry of Iron Smelting," make the following interesting observations:

"The yearly make of iron from Cleveland stone alone, contains 30,000 tons of phosphorus; worth for agricultural purposes, were it in manure as phosphoric acid, above a quarter of a million; and that the money value difference between Cleveland and hematite iron is not short of four millions sterling, chiefly due to the presence of this £250,000 worth of phosphorus.

"The Pattinson process does not leave one part of silver in 100,000 of lead; the Bessemer converter robs iron of almost every contamination except phosphorus, but nine-tenths of this ingredient is expelled by the puddling furnace.

"It may be difficult, but let it not be supposed there would be any surprise excited in the minds of chemists, if a simple and inexpensive process for separating iron and phosphorus were made known to-morrow, so that only one of the latter should be found in 5,000 of the former; and now that there is such a margin to stimulate exertion, we may be sure the minds of properly qualified persons will be directed towards the solution of a question of such national importance."

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457. Petroleum in London.—We are wont to think that we are ourselves the most reckless people on earth, in regard to dangerous and incendiary materials. Witness, however, the following from the London *Globe*, of July 6th:

"The dangers to which we, in populous city pent, are daily exposed, prove to be so many and serious, that it is well the public do not stay to consider them. We are liable not only to all sorts of accidents arising from street traffic, and from the fall of insecure buildings and scaffolds. There is another fearful source of peril to life seldom contemplated, but which may at any time discover itself. We allude to the abundant presence among us of destructive chemicals. Huge vans laden with petroleum and other combustibles daily rumble through the streets, and so careless are the drivers, themselves ignorant of the nature of their cargoes, that a frightful explosion may at any time occur in the most crowded thoroughfare. We knew this. We were not, however, prepared to hear that on a wharf at Bow are now stored no fewer than four hundred thousand barrels of petroleum. This incident has been brought before the notice of the Board of Works, which referred the subject to a committee. Let us hope this committee will instantly order its removal. While they deliberate a vast district may at any moment be subjected to a fearful wreck of life as well as property."

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458. Native Vegetable Ink.—Rev. F. Moigno.—The author states that experiments are being made to acclimatise in Europe the *Coriaria thymifolia*, or ink plant of New Granada. The juice of this plant, locally termed *chanchi*, is at first of a somewhat reddish color, but becomes intensely black in a few hours, This juice can be used for writing without requiring any further preparations; it corrodes steel pens less han ordinary ink, and has, moreover, the advantage of better resisting chemical agents. When the portion of America named above was under Spanish dominion, all public documents were written with chanchi, which was not removed from paper by sea-water. —*Les Mondes.*

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459. Ventilation.—Dr Angus Smith gives a good rule for ascertaining the amount of carbonic acid in the air of houses: "Let us keep our rooms so that the air does not give a precipitate when a 10½ ounce bottleful is shaken with half an ounce of clear lime water," a sanitary regulation which can easily be carried out.—*Scientific American.*

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460. Rapid Dryer for Oil Paints and Varnishes.—C. Mene.—In 100 parts of water are dissolved, by the aid of heat, 12 parts of best shellac and 4 parts of borax; this solution, after cooling, is poured into bottles, which should be well corked. According to the author, this solution may be mixed with some oil of turpentine, with oil-paints, to render them rapidly drying, while the liquid may also be employed as a varnish.—*Chemical News.*

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461. The Petroleum District.—The whole number of acres of land which have as yet produced petroleum, is stated by the Titusville *Courier* to be about 6,500—equal to ten square miles. This plot of land, constituting about one two-hundreth part of what is known as "the oil region," produced during the year 1871, 5,790,000 barrels of oil, which at $4.50 per barrel—the average price for the year—reaches the snug sum of $26,055,000. The same region has produced since 1859, 33,301,000 barrels of oil, which probably yielded not far from $160,000,000. And so far is this wonderful region from being exhausted, that the value of the land is greater today than at any time since the discovery of oil, except during the times of the great excitement in 1865.

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462. Absorption of Gases by Charcoal.—Hunter. This paper contains on account of the effects of variation of temperature on the amount of ammonia and cyanogen absorbed by cocoanut charcoal. In the case of ammonia it would seem that the amount of the gas absorbed by the charcoal continuously decreases as the temperature rises from 0° to 55°, but at that point a sudden change occurs, and the amount of gas given off becomes considerably diminished. In the case of cyanogen the absorption takes place very rapidly, being confined almost entirely to the first ten minutes, and the curve representing the absorption between 0° and 80° is continuous. The results obtained are given in tables, and also represented by absorption curves. Hydrogen and nitrogen are very slightly absorbed by the charcoal.—*London Chem. Society.*

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463. Prussic Acid from Nitrobenzole, Etc.—J. Post and H. Hubner.—The authors, after alluding to an observation made as far back as the year 1828 by Dr. Wohler, viz., that picric acid yields, by treatment with baryta water, hydrocyanic acid, state that they recently found that even dinitrobenzole when boiled with caustic soda or dotassa solution, becomes decomposed, hydrocyanic acid being evolved, which the authors converted into cyanide of silver and ferrocyanide of iron, alias Prussian blue. The dinitrobenzole operated upon was perfectly pure; the alkali was prepared from sodium, and as regards potassa, specially tested for its perfect purity. Common nitrobenzole yields hydrocyanic acid when fused with caustic alkali, and picric acid does the same when boiled with a solution of that substance.—*Ger. Chem. Soc*

Early Patents Relating to the Hydraulic Seal.

[In issue of Aug. 2, p. 43, we requested information about the former history of inventions in this direction. Mr. F. J. Davis of Waltham, Mass., has transmitted us since, a pamphlet, entitled "Giles's Patent Multifold Pressure Reliever," from which we are pleased to take the following notes on the subject, adding that we have had no opportunity, however, to examine the records ourselves and verify the accuracy of the extracts, of which nevertheless we entertain no doubt as to authenticity.—Ed.]

Thomas Spinney's English patent for "Improvements in Apparatus for Manufacturing Gas for Illumination," granted June 2, 1831.

This invention consists "in the adaptation of a valve of any suitable construction to the ascension-pipe of a gas retort, oven, or generator, for the purpose of superseding the necessity of the hydraulic main hitherto used. This may be effected by passing the ascension-pipe through the bottom of a closed box containing water or other fluid; the mouth of the ascension-pipe is elevated above the surface of the water, and suspended over it is a cap or cover which may be depressed by a screw till its edges, enclosing the ascension-pipe, enter sufficiently into the water to prevent the gas passing around. The box is provided with a suitable opening to allow of the thorough passage of gas when the cap is again elevated."

J. and T. Kirkman's English patent, granted July 22, 1852.

The third claim of this patent relates to "a mode of carrying off the gas from retorts to the receiver or gas-holder without the use of the hydraulic main, and consists in superadding 'a direct passage' for the gas to that usually employed, namely, through the hydraulic box or main. This direct passage may be closed when required by a suitable valve."

A. A. Croll's English patent, granted July 7, 1853.

The fourth feature of his invention "relates to the use of balls or other weighted valves in the different passages from the retorts to the main, by which, while a fresh charge is being placed in any retort, the passage from such retort to the main may for the time be closed, in substitution of water-sealing in the hydraulic main."

W. C. Holmes' English patent, granted June 20, 1855.

These improvements consist, "firstly, in the introduction into a retort or carbonizing vessel of a flue or draught-tube made or cast separately from the retort, and also the insertion of shelves or diaphragms, either horizontal or vertical, made or cast separate from the retort, and made to fit loose in the interior."

"Thirdly, the arrangement of self-acting (hydraulic) valves for dispensing with the present hydrauli main. This may be effected by a cup inverted over the mouth of the inlet-pipe, and suspended by a spring in water."

[Since the above was put in type, the following document, emanating from the Chemical Examiner in the United States Patent Office (who is attacked, by implication, in this pamphlet) has been sent to us. In justice to all parties we insert it.—Ed.]

[Copy.]

Washington, D. C., August 15.

Sir: My attention has been called to a pamphlet entitled "Giles's Patent Multifold Pressure Reliever," in which the relation of the Gibson, the Jones, and the Giles patent improvements in devices for taking off the gas without pressure is discussed. The writer of the pamphlet is either very little acquainted with the law as regards patents for useful inventions, or else intentionally misrepresents the case. After referring to the English patents of Spinney, June 2nd, 1831, No. 6,123; Kirkman, July 22d, 1855, No. 1621; Croll, July 7th, 1853, No. 1621, and Holmes, June 20th, 1855, No. 1405, the writer criticises the examiner very sharply for issuing the Gibson patent of October 5, 1869.

How unjust these severe lines are, will appear from a statement of what is clearly shown in the several English patents referred to. In Spinney's patent the hydraulic main is entirely suspended. He places an inverted cup over the end of the projecting tube in the stand pipes, and has no hydraulic main at all.

It has nothing whatever to do with Gibson's claim, for a valve between the retort and the hydraulic main. Spinney's patent was issued more than forty years ago, and has never been used. In fact it is entirely worthless, and is not covered either by Gibson, Jones, or Giles. Any one, if desirous of using it, may do so without danger of infringing any of these patents.

J. & T. Kirkman's English patent is for a complicated apparatus for making water gas, common coal gas, and oil gas, and for enriching or carburetting them. He distinctly states that the third part of his invention is for "a mode of carrying off the gas from the retorts to the receiver or gas-holder, without the use of the hydraulic main." Gibson, Jones, and Giles all use the hydraulic main, and it is a necessary part of Gibson's claim. Kirkman's patent, therefore, has nothing whatever to do with the matter. It, like Spinney's, is no where used.

Croll's English patent of July 7, 1853, No. 1621, of 1853, like both the others above mentioned, dispenses with the hydraulic main. The main referred to by Croll is not the hydraulic main which he wished to get rid of, but the main leading to the gas-holder. No one uses Croll's invention.

The English patent of W. C. Holmes, June 20, 1855, No. 1405, speaks of a self-acting hydraulic valve, which he claims will take off the gas without pressure, but shows no means for doing it. His figure 13, which he says shows this part of his invention, is utterly inoperative. No one does or could use it for any purpose. So far from self-acting, it will not act at all. The fact of the matter is, the writer of the Giles pamphlet does not correctly represent the Gibson invention.

By referring to Gibson's description it will be seen that he begins with the standard gas works, as usually built in this country and in England, with stand pipe and hydraulic main. He dispenses with the dip pipe entirely, but not with the hydraulic main.

For the purpose of closing the stand pipe he puts in a cut-off, or common stop valve. His invention requires little alteration in gas works as heretofore constructed, and it won favor almost as soon as presented to the public. It was, however, defective in not providing a way of escape for the gas when the valve should by accident be left closed, while the gas was coming off. This defect was remedied by the Jones invention, which provided two ways for the gas—one with a dip-pipe, and the other without, but capable of being closed by a valve. The Giles patent took the principle of the Jones patent, and arranged the openings from the retorts which are to be closed with a valve, so that one valve when operated would open or close the passage to a whole bench of retorts. But there is not the slightest doubt that the Giles invention infringes the Jones claim, and this is shown on the face of the Giles specification.

It is not alleged that the Jones patent is anticipated by anything, and I have shown above that Gibson's claim is not met.

As Giles expects the public to respect his rights in his inventions, he should be equally careful to respect the rights of other inventors. "He that would have equity must do equity."

Thanks, however, to the enlightened action of the courts of late, many have been compelled to respect the rights of inventors, who were not so disposed. Were it not that I should make my letter too long I would refer you to many recent decisions, showing that just such patents as those of Gibson and Jones which have gone into use, have been sustained in the face of a much larger mass of dead matter than is shown in the four old English patents, cited by the writer of the Giles pamphlet. See on this point Judge Shepley's decisions in Murphy et al. *vs.* Eastman et. al.. U. S. Patent Office Gazette, July 16, 1872, vol. 2, p. 61, and Judge Blatchford's decisions in Hitchcock *vs.* Tremain, Patent Office Gazette, June 25, 1872 vol. 1, page 654. Respectfully yours,

(Signed) B. S. Hedrick.

[The following is the passage referred to in the *Patent Office Gazette*: "This is one of those cases so often met with in the history of patents, where an invention once perfected has shown itself to be so useful and so highly appreciated as to have gone at once into so extensive use, that it is inherently impossible it should have been known before, and not have gone into general use. Its success leads infringers and rival inventors to set up crude and unsuccessful experiments as anticipating it, and dim recollections are stimulated and conscience is strained to clothe with living flesh, what was an inert and useless skeleton."]

Galvanized Iron is coming more and more into use as a building material. Almost every considerable town in the Eastern and Middle States, now has its iron roofs, and what with iron joists, iron girders, iron lath, etc., the American people bid fair to soon rival Europeans in the use of this cheap, durable, and substantial material for building purposes.

British Association of Gas Managers, June, 1872.

COOKING BY GAS, BY MR. HARTLEY OF WESTMINSTER.

The persistence—the vitality, so to speak—of prejudice is manifested, probably, in respect to no other useful application more strongly than it is in respect to the employment of gas for cooking purposes. It is still very generally believed that the flavor of the gas permeates the food cooked by its aid, and that a further contamination arises from the absorption by the food of some extraordinarily poisonous compounds which are producible by burning gas alone, and not by any other combustible body. Hence it is that although the advantages of gas for cooking purposes have been proven facts for more than half a century, and although its use has been adopted for cooking in hospitals, many clubs, gentlemen's mansions, public institutions, and places of entertainment, not more, perhaps, than one or two per cent., at most, of the general body of gas consumers throughout the kingdom so employ it. This state of things is certainly not creditable to the producers and vendors of gas, whose business—and it may with propriety be said, *duty*—it is to urge the employment for every really useful and beneficial purpose of the article they produce and sell, not only on the ground of commercial interest (for the extended use of gas for cooking would, especially in the summer time, help greatly to keep the mains profitably employed), but on the higher ground of moral obligation towards their customers, who would, in the majority of cases, be vastly benefited by the substitution of gas for fire cooking, both in respect to economy and comfort. The advantages would, of course, be at the maximum in summer time, when the days are bright, long, and warm; when, therefore, the distributing apparatus does the least work, and when there is little or no necessity for keeping fires burning. The writer has said that the present state of things in respect to gas cooking is not creditable to the makers and vendors of gas, and he believes he is perfectly justified in asserting this, notwithstanding that he is perfectly cognizant of the labors of the late Mr. Sharp, of Southampton, and of contemporaries with him, of whom Mr. Goddard, at Ipswich, is an example, and of a number of successors down to Magnus Ohren, whose little book is the most recent, and who is an ardent advocate for gas-cooking, because the writer recognizes the broad fact that gas cooking is not yet popularized, and he perceives that the advocacy of the use of gas for cooking is left far too much in the hands of those who are merely interested in the production and sale of cooking-stoves. Believing that a discussion on this subject by this association will be alike advantageous to producers and users of gas, the writer has, at the invitation of the committe. been induced to prepare this paper; feling satisfied that it will be kindly and considerately received, notwithstanding that the knowledge of the subject displayed may, and, indeed, must be, far below that of many members of this association.

The writer proposes to do no more than open up ground for discussion by a few remarks on the construction of gas cooking stoves, such as may be used by ordinary consumers—the materials of which they should be made, the kind of burners most suitable, the objections of the public, and, in conclusion, suggest some few arguments which may possess a little originality, and, in addition to those in existence, assist in convincing the incredulous in respect to the advantages and healthfulness of gas cooking. The writer expects in one or two points to be in opposition to the views and opinions of some, and he wishes it to be distinctly understood that he puts his views forward in no spirit of dogmatism. Papers for an association like this should be definite in expression, and it is better for a writer to be wrong and explicit, than doubtfully right, for the wrong, when explicitly stated, is sure to be corrected, while the doubtfully right might pass unchallenged because not noticed or not understood.

In respect to construction, leaving out of consideration such large stoves as are used in hospitals, clubs, etc., the writer is of opinion that the oldest and simplest forms of stoves are the best, those which are mere cupboards fitted with a series of gas-jets at the base, and with an outlet tube or funnel near to or upon the top, the stoves being provided with a series of moveable shelves, adjustable as to height, and provided with the means of suspending one or more joints. Reverberatory stoves, with which the vitiated air is discharged at the lower part, the writer does not think well of; they do not perform their work better than the others, if so well: the products of combustion are less easily disposed of, and they are not so convenient and manageable; while he regards those containing an inner chamber and a surrounding pocket as positively disadvantageous, inasmuch as more gas must be required to perform a certain quantity of work, and it is a grave question whether the heated and moist air of the gas flame, when brought into contact with the food, and especially so in respect to meat, does not tend to the better cooking of the same, and the preservation of the juices. Moreover, the brisk circulation through a stove or oven, such as the writer advocates, tends to prevent effluvia of one article of food flavoring another. A common defect in gas stoves or ovens is to make the air-openings—especially at the base—too large, so that too active a circulation is kept up, and more gas needs to be used in consequence. The air openings should be capable of adjustment to suit the necessities of consumption, which vary with the articles to be cooked. The rectangular stove is by far the most advantageous, as it is more roomy and more convenient in use; but the shelves should be always self-sustaining when drawn two-thirds out of the oven, so that the two hands of the attendant may be free to remove dishes, etc. A very simple method of rendering the shelf so self-supporting was suggested by the writer to a friend, and put into practice some time since.

As regards the material of which a stove is to be constructed, the writer prefers for small and moderate sized *wrought-iron*, because the stoves are lighter, cheaper, and more quickly heated up than cast-iron ones, or stoves of porcelain or fire-clay. If the stoves are double-bodied, with an air space between the inner and outer parts, after the fashion of stoves constructed some years ago by Mr. Geo. Garnett, when at Portsmouth, or covered with a jacket of wood, after the style of the admirable stoves constructed by Mr. Sharp, so much the better, but these additions render the stoves more expensive.

As regards the kind of burner to be used in a gas cooking oven, the writer is in direct antagonism to the generally received notion that the Bunsen—that is, the burner in which the gas is mixed with air before combustion—is the best. It is a common mistake, although it may be one into which none of the members of this association have fallen, that gas burned from a Bunsen burner yields more heat than when burned from an ordinary burner. It does no such thing, although it is true that, under circumstances such as will be mentioned presently, more heat may be utilized when a Bunsen burner is employed, but this cannot be the case in an oven. In proof of this position, the writer may mention some experiments which he made in cooking. Two burners were made to fit the same oven, one burner being of $\frac{3}{4}$-tube, on Bunsen's principle, and the other a $\frac{3}{8}$-tube, with simple jet-holes. Two joints of meat and other articles of food, of the same weight and character respectively, were cooked in turn by the aid of each burner, and it was found that the same quantity of gas, as measured by a test-meter, was used in each case. To confirm these results, a delicate thermometer was suspended in the oven, so that it could be observed from the outside, and it was found that, for equal consumption of gas, the temperature was raised through the same number of degrees in equal times, until, in each case, the thermometer indicated 410° F., at which point it remained stationary.

Another notion which the writer is disposed to believe erroneous, although he is not prepared with demonstrative evidence in support of his belief, is that with the Bunsen burner a more complete combustion of the gas is effected than with the ordinary jet. The writer has noticed that the effluvia from gas burned apparently in a proper manner from a Bunsen is sometimes much more offensive than the effluvia from the same gas burned under ordinary conditioes, and this has led him to doubt whether the Bunsen approximates in its effects to the rendering of a combustion really perfect. This is a question, however, upon which the writer bases no argument. The great disadvantage of a Bunsen burner, in an oven especially, is that the range of temperature producible is so limited; you must have a great heat or none at all, for if the gas be turned low the flame flies back to the source of supply, no useful heat is evolved, and intolerable and suffocating fumes are given off, owing to the imperfect combustion of the gas. With the jet fishtail, or bat's-wing, the gas may be burned at almost any rate of consumption: hence food may

kept simply hot, if desired, and the oven, if kept bright and clean, may even be made available as a drying or airing closet.

For boiling purposes the Bunsen burner is to be preferred, because the bottoms of the vessels can be kept clean, and there is no smoke given off. As far as economy in gas consumption is concerned, there is not much to choose between a Bunsen and a bat's-wing. Some experiments which the writer has made show that 16 cubic feet of gas would raise a measured quantity of water in an open pot from 52° F. to 180°, when burned in a Bunsen upright burner with the flame in contact with the bottom of the pot, and that 16·4 cubic feet sufficed to raise the same quantity of water to the same temperature when the gas was buned from a bat's-wing with the tips of the flame just touching the bottom of the pot; the percentage in favor of the Bunsen being only ·025 per cent. With the bottom of the pot two inches above the top of the respective flames, the advantage was decidedly on the side of the bat's-wing burner.

The objections against cooking by the aid of gas are as far as the writer's experience goes, something like the following:

1. That gas is a very noxious compound, and when burned yields products different in character and more prejudicial to health than coal or coke fuel does.

2. That the gas and its products of combustion are capable of flavoring and contaminating, and do flavor and contaminate, the food cooked by its aid.

3. That cooking by gas is quite as troublesome and not more economical, in any sense, than cooking by the aid of an ordinary fire.

Against these objections the writer would urge, as he has on many occasions urged—1. That gas is composed of precisely the same elements as coal—namely, hydrogen, carbon, sulphur, oxygen, and nitrogen; and these elements, when combined in the form of coal or in the form of gas, or combustion in air or in oxygen, yield exactly the same products—namely, water, carbonic acid, sulphurous acid, and nitrogen, with perhaps minute portions of nitric acid, which is producible when a mixture of hydrogen and nitrogen is burned in air or oxygen, so that gas and the products of its combustion can by no possibility contain anything more hurtful than coal or the products of its combustion. The argument may be carried out much further than this, however. The only real impurity in coal and in gas is sulphur, which exists in coal as pyrites, and in gas, as delivered to the public, as sulphides of carbon. Now, the best Newcastle house coal contains about 1¼ per cent. by weight of sulphur, and some of the cheaper coal very much more. One highly pyritic sample which the writer analyzed, contained as much as 7 per cent., so that it will be fair to assume that the average for house coals is not more than 1½ per cent. Admitting this to be the case, then, 1 pound of coal will contain 105 grains of sulphur, which in burning yields 200 grains of sulphurous acid. One pound of gas of the gravity of ·410 would measure 34·4 cubic feet, and assuming that the gas contained *three* times the quantity fixed by Act of Parliament a few years since (20 grains per 100 cubic feet) as the maximum for sulphur impurity, or 60 grains, then 34·4 cubic feet would contain 21·6 grains of sulphur, and yield only 43·2 grains of sulphurous acid. Of the other products of combustion—viz., water and carbonic acid, gas evolves more of the first, which is perfectly innoxious, and much less of the second; for while 87 per cent. of ordinary house coal consists of carbon, coal gas, according to Lewis Thompson, contains only 72·1 per cent. by weight. So that 1 lb. of coal contains 6090 grains of carbon, which, on burning, is capable of producing 22,330 grains of carbonic acid, while 1 lb. of gas contains 5047 grains of carbon, capable in burning of producing 18,507 grains of carbonic acid. This statement does not, however, represent the true relations of coal and gas; their respective heating powers must be taken into account. It is easily proved by Thompson's fuel test that 1 lb. of house coal will raise 967 parts of water through 8° F. of temperature, and the multiplication of these numbers together gives 7736. In other words, it may be said that 1 lb. of coal will at best raise no more more than 8000 lbs. of water through 1° F.

Dr. Letheby, in agreement with the experiments of Mr. F. J. Evans, stated in the valuable lecture delivered to this association in 1866, that 1 lb. of ordinary coal gas will raise 21,060 lbs. of water through 1° F. of temperature. So that, in round numbers, 13 cubic feet of gas will produce as much heat as 1 lb. of coal. In respect to sulphurous acid, the gas would produce only 16½ grains, as against 200 for coal; and of carbonic acid gas would produce 6380 grains, as against 22,330 grains. It may fairly be said that a single down draught would cause more of these gases to pass over a joint roasting in front of a fire than it would be exposed to during the whole time of cooking in a gas oven, and that a chop or steak cooked over a coal or coke fire is exposed to vastly more of these gases, but no person ever appears to have suspected that the meat would be contaminated, or the eater thereof be poisoned; certain it is that medical history fails to record any such extraordinary and lamentable result. The actual fact remains to be pointed out in respect to these gases, which is that, although they are injurious to inhale, and even quickly destructive of life unless largely diluted with air, they are quite harmless in any action on food, and that one of them—carbonic acid—is a necessary ingredient in water, beer, ærated fluids and bread, and is actually beneficial when taken into the stomach.

In respect to the second objection, it may be easily shown that food under the influence of a high heat, and especially of a circulating heat, is really indisposed or incapable of absorbing gaseous fumes or vapors. All articles of food, especially those which are cooked by roasting or baking, contain coagulative matters, such, for instance, as albumen. Albumen coagulates at about 150° F., so that a joint is no sooner exposed to a roasting heat, which is from 300° to 400° F., than its outer surface becomes coagulated and practically impenetrable by gases; in addition to which steam is generated within the viands, and this is projected with so much force that it effectually repels the entry of anything else. True, in a close oven having no air circulation, there is a sort of general flavor communicated to meat, but the writer believes the contamination, so to speak, is confined to the surface, and is due to the complete saturation of the expelled juices, and the adhesion of a small portion of their coagulative matters as they flow over the joints, which effect is much more likely to ensue in the comparatively dry atmosphere of a close oven than in a gas-heated one

As regards the first part of the third objection, it is sufficient to say that with gas there is no time wasted in the making, and waiting for a fire to burn up, and the labor is nothing. The gas has only to be lighted and adjusted, the food put in the oven, and it may be so nicely timed, with very little experience, as to require no attention until it is done, and needs taking out. As to economy, Mr. Ohren's experiments, which are quite concordant with others made by the writer, show that the cost of cooking joints of equal weights is on the average 2·37 pence with gas, and very nearly 4d. with coal, while the absolute waste or loss of weight is twice as much, at least, with fire cooking than with gas cooking. Even if the fire be utilized for boiling purposes, and gas be used for both boiling and roasting, the writer found that gas was by far the most economical in relation to the weight of the food cooked.

The writer's experience also leads him to the conclusion that in cooking vegetables, puddings, etc., it is far more economical, on most occasions, to effect the cooking by steam, than to employ the gas directly for boiling.

The writer may mention a useful hint of the late M. Soyer, the great cook, to preserve the juices in boiled meat and ensure its tenderness:

"Dip it in boiling water for a few minutes and then immerse in cold water, and raise it to the boiling point, and simmer until cooked."

Apply this idea in gas roasting; raise the gas high for a short time, and then adjust the requisite consumption. In each case, coagulation of the surface is effected, and the juices are imprisoned, or, at all events, in roasting the surface is coagulated more promptly.

The writer thinks that the facts and reasonings which he has adduced certainly show that gas, as applied for cooking, is, in comparison with other fuel—

1. More healthful.
2. More certain.
3. Less troublesome.
4. Less expensive.
5. Less wasteful, by loss of weight.
6. Less costly, unless, indeed, the waste heat from a necessary fire is employed.

While, lastly, it certainly is—

7. Much cleaner.

Mr. Ohren—Sydenham—said he had paid some attention to gas cooking, and differed with the writer of the paper on one point. Mr. Hartley stated that gas stoves made of plain sheet iron answeared for all purposes of cooking, and that he saw no benefit in using porcelain plates. When these stoves were originally made, plain iron plates were always employed in their construction, and when he—Mr. Ohren—first commenced to use them he found there was a great nuisance from the smells which escaped in the course of cooking; this he ascertained arose from the grease—from the spurting of fat in the joints—getting on to the plates, where it became burnt; when porcelain plates were employed no such unpleasant smells occurred. The reason why he preferred an atmospheric to an ordinary burner in these stoves when common gas was used was that occasionally the cook would turn the gas on too high, and not only smoked the stove but also the joint, which gave it a very unpleasant flavor, this carelessness on the part of cooks no doubt gave rise to the idea that cooking by gas was injurious to the meat. With an atmospheric burner there was no smoke. It was true, as Mr. Hartley stated, that there was occasionally a very bad smell from the atmospheric burner, but that arose from the same cause—viz., that of allowing too much gas to pass through it. When an atmospheric burner was turned up too high there was not a proper combustion of gas; the portion unconsumed escaped, and of course there was a smell from it. On this account it was that he advocated the use of a regulator in gas cooking-stoves to adjust the burners to the exact consumption required. If regulators were adopted there would be no complaints of smells or nuisance of any sort, nor would any pipe be required to carry off the burnt products. Gas engineers ought to pay very careful attention to the stoves they supply, and consumers to see that they were properly constructed and fitted up; if they did so, cooking by gas would be rapidly extended. It was wonderful how little knowledge there was amongst gas consumers as to the benefits to be derived from the use of gas for cooking. Gas-stoves had been known for a long time amongst professional men, and had been employed in some localities perhaps more than in others, but the general public seemed to know nothing about them. His experience was that whenever they were properly introduced by gas companies the consumers readily availed themselves of them. In connection with his own company he had turned his serious attention to the subject, and had sent out a large number of cooking and heating stoves, which had given great satisfaction to the consumers.

Mr. Methven—Bury St. Edmunds—said neither the writer of the paper nor Mr. Ohren had touched upon the great objections to gas cooking. According to his own experience these might be regarded as two-fold; first, the cost of the stove, and secondly, the cost of the gas. Mr. Ohren had certainly indicated one method of surmounting the first objection—viz., the letting out of gas stoves on hire by gas companies at a moderate rate; but the second objection was unremoved. He usually found that if the person who had charge of the apparatus was not the person who paid for the gas, it was extravagantly used, so that it was found very expensive even to heat a large quantity of water by means of gas. He had known an instance in which that objection had been remedied by affixing to each gas stove a separate meter, and letting the cook know that he or she was responsible for the excess of gas consumed. He regretted that Mr. Ohren had given utterance to so heterodox a sentiment that in any case there was no necessity for a flue to a gas-stove. He—Mr. Methven—believed it was always necessary, and that the absence of any arrangement of the kind had caused much annoyance and trouble to those who used the stove. The products of combustion must go somewhere, whether an air burner or an ordinary burner were employed; and he was sure it was a great mistake to recommend a gas-stove for cooking purposes without there were the means of placing it under a chimney, or a flue leading directly into a chimney.

Mr. Goddard—Ipswich—said he had perhaps had as much to do with gas-cooking as any gentleman in the room. He was induced to devote his attention to it chiefly with the view of getting a daily consumption of gas in the town, so as to make the mains profitable by day as well as by night. Accordingly he advised the company he represented to supply gas-stoves, and all kinds of gas apparatus to the consumers, both for heating and manufacturing, as well as for baths, at a moderate rental. The arrangement was carried into effect, and had answered exceedingly well for a long period of time. He believed he was the first to introduce porcelain tiles into the construction of cooking stoves, about twenty five years ago, and he did it for this reason—that porcelain being a better non-conductor of heat than metal, he thought there would be more economy in this respect, and, as it was very cleanly, it would avoid the unpleasant smells which were created of grease upon the hot metal plates. The plan adopted at Ipswich was for the company to supply the fittings and apparatus, and to do the work of fitting up, charging the consumer 10 per cent. upon the cost price. The great difficulty which had always attended gas cooking was the imprudent use of the gas by the domestics. He once fitted up a gas-stove to cook for 300 people, but the consumption of gas was found to be so large that the proprietor of the establishment felt that he must abandon its use. He—Mr. Goddard—recommended him to have a meter attached to the apparatus itself, and to offer an inducement to the person who had the management of the stove to reduce the consumption to its minimum amount. The plan succeeded admirably; day by day the register of the meter was taken and an amazing economy was effected. When the proprietor imagined that he had reached the minimum consumption he made a very handsome offer to the cook that for all gas saved beyond that point he would give him an equivalent amount. The consequence was a still further and very considerable reduction in the consumption, because the gas was not allowed to burn when there was nothing to be cooked. He—Mr. Goddard—believed the only real difficulty which gas managers

had to contend with in extending the use of gas-cooking apparatus, was the want of care on the part of those who used it.

Mr. Jones, of Dover, said there was one objection not yet touched upon by previous speakers, namely, the necessity of having additional pressure on during the day time, and the consequent additional leakage sustained by gas companies supplying cooking stoves.

Mr. Warner, of South Shields, said some years ago a similar experiment to that recently made by Mr. Ohren was attempted; a pamphlet was got up and circulated, gas-cooking stoves of a novel character were devised, and a dinner arranged, to which the mayor and some members of the corporation, with the representatives of the press were invited. They all partook very heartily of the banquet and enjoyed it much, and, as might be supposed, pronounced a highly favorable verdict on the plan. The system was adopted, and he did not think there was any alteration made in that instance in the pressure for the purpose of cooking apparatus, but this result arose from their introduction, namely, that during the first quarter after the introduction of the stoves, a very large additional quantity of gas was consumed—some hundreds of thousands of feet. He believed that wherever the plan was introduced this would be found to be the case, and the company would have a large part of their apparatus now lying idle during the summer months profitably employed. This was a very useful subject to be introduced for discussion at the meetings of the association, and he hoped all the members would derive advantage from it.

Mr. Irons, of Gosport, said he believed that at Bath the committee did put on extra pressure for certain houses where cooking stoves were in use. At Gosport, one of his customers had a stove of this kind, and was rather dissatisfied with the supply of gas he obtained for it. Being a shareholder of the company, however, he was induced to remedy his complaint by enlarging his fittings. When he, Mr Irons, was engaged in the suburbs of London, there were 400 or 500 cooking and warming stoves used in his district in private houses, whitebait taverns, and for greenhouses. There being great objections to chimneys for outbuildings in the neighborhood, ordinary greenhouse stoves could not be used, and gas was employed for heating purposes. The one great difficulty which gas companies had to deal with was, the necessity for extra day pressure. If a sufficient number of consumers could be got to use them, if there were not such a prejudice against gas companies, and if people could be induced to follow the advice of managers, in having efficient fittings, the ordinary day pressure would in most cases be enough.

Mr. Anderson, of London, thought the members were under obligation to Mr. Hartley for bringing this subject before the meeting. It was a practical question in which all present were interested, and upon which very much of the success of their undertakings depended. Almost all the difficulties to which they were exposed in reference to gas cooking arose out of the ignorance of the public or the prejudices so commonly felt against the adoption of anything new. He quite agreed with Mr. Ohren that in some cases a gas stove might be fixed without a chimney, but that must only be where the ventilation was good, otherwise the products of combustion would necessarily become a nuisance. It required discretion and judgment on the part of gas managers in deciding what should be done, and in providing artificial ventilation where the natural ventilation of the place was inadequate. The adoption of gas cooking apparatus would be a gradual process, and they must not expect consumers to be converted to it all at once. As to the necessity for increased pressure, of course, if it was desirable to encourage the use of gas stoves, this must be provided, and if this resulted in increased leakage, it would make managers look out more sharply to detect it. At a place in Ireland where the works were under his control he had been called upon to supply gas to a milk condensing factory for the purpose of soldering the cans in which the milk was stored. The apparatus employed was a hot plate with a groove in it, which was filled with solder, and a nice even heat was required in its use. In that town no day pressure was given, but as it seemed to him desirablo to encourage this branch of industry he resolved to try what could be done. Pressure was put on, the main-valve to the town was closed, and during the whole of the day the gas was passed through a meter. His experience then was that the leakage was very little indeed, and the supply was continued in a most satisfactory manner.

Mr. Broadhead, of Grimsby, said he had some experience with this kind of apparatus in Leeds some years ago, and his experience was that on account of the smallness of the consumers fittings and the carelessness of servants in burning the gas when no cooking operations were in progress, that which ought to be an economical arrangement was a very expensive one.

Mr. Ohren said with cooking apparatus in use in his district the pressure on the mains was only five-tenths. With respect to burners, it should be always borne in mind that there should be a sufficient number for the quantity of gas required, and that they should not be turned up too high. Instead of having a small ring of jets, and burning them at their maximum capacity, it was better to have a large ring and burn them at a moderate height. If this were carefully attended to, there was no more need for a chimney with a gas stove than there was for a chimney over the burners in a room.

Mr. Johnson, of London, said he had great experience in gas consumption for cooking purposes. In the city of London district there were hundreds of these stoves in daily use, some which consumed 3000 or 4000 cubic feet of gas per day. He had always found the same objection which had been spoken of, namely, the expensiveness of the process owing to the carelessness of servants. A friend of his had just invented a small apparatus by which he made the joint of meat turn the gas on to the proper height. It acted directly by a lever on the cock which supplied the gas, and when the joint was taken away, the act of removing it turned the gas down to a small blue flame. By this means it was put beyond the control of the servant altogether. A similar arrangement made the removal of a saucepan turn down the gas beneath it until it was wanted again. This apparatus was also applicable to tailors heating apparatus and for soldering irons, and every description of burner used for heating purposes. If gas engineers would direct their attention to this arrangement, he thought they would be able to induce people to use gas more generally than they had hitherto done.

Mr. Hartley, in reply, said that he was happy that the subject of gas cooking excited so much interest, and that those gentlemen who differed from him on certain points had so frankly spoken. Mr. Methven stated that the principal reason why gas-cooking stoves were not more widely used was that gas-cooking was costly, owing to the extravagance of servants, who would waste the gas. He, Mr. Hartley, had experienced something of this waste, but the fault was not in the gas—other fuel was also wasted by servants, and it certainly would be quite as reasonable to find fault with the coal merchant as with the gas-maker. Gas-makers could teach people how to use cooking apparatus, and then leave them to make the proper application of the fuel. In dealing with cooking in the paper, he, Mr. Hartley, had of course addressed himself only to the relative value of each agent when properly used. Gas stoves were made of various materials, and opinions as to the advantages of each would differ. Porcelain plates were certainly clean, and possibly, as Mr. Goddard said, there was less radiation externally, but these plates could not be entirely dissociated from iron frames, and in spite of all care in fitting, there was a liability for the grease to get on to the iron, and then some unpleasant smell would be produced, although perhaps not to the same extent as with simple black iron stoves. He, Mr. Hartley, preferred tinned iron for the body; it stood well, was cleaner than untinned iron, and gave off much less of objectionable fumes when the grease came in contact with it. With respect to burners he adhered to the preference he had expressed for the ordinary jet or fishtail. Mr. Ohren said these gave rise to smoke, and that when governors were used with the atmospheric burners, there was no difficulty attending their employment. Well, governors could be used with the ordinary burners just as readily as with the atmospheric, and smoking thereby be prevented. In fact all gas ovens should be supplied with gas through governors. In respect to day pressure and its increase, that was a matter for experience. In London and many large towns, no increase of day pressure is needed for cooking purposes, because the companies are obliged, under Act of Parliament, to keep up sufficient pressure in the day time, and no doubt a similar obligation will be imposed on most, if not all the gas companies in the kingdom, and it would then become a question of utilizing what is given. He, Mr. Hartley, begged in conclusion, to thank the president and the members for the courteous attention they had given to him.

[From the New York *World.*]

The Price of Gas.

To the Presidents and Directors of the several New York Gas Companies:

Sahibs: Monopoly ridden as this country is, robbed and swindled as the whole people are by the woollen, cotton, iron, salt, medicine, and other monopolies, I can find nothing equal for its extent to your gas monopoly.

True the wool monopolies swindle the people out of some $50,000,000 annually, which is one and one-quarter of a million dollars steal on one million of people.

The iron monopolies steal about $20,000,000 annually, which is $750,000 to a million of population.

The cotton monopolies steal about $30,000,000 annually, which is $750,000 to a million of population.

But your gas monopoiy squeezes out of the one million of people in the city of New York something like $3,857,872.

As I don't go by guesswork, and as I promised you figures and facts, I will show you who know, and others who don't know, exactly how it is.

I have fully proven to you and to the people of New York in my first letter that you can afford to manufacture gas and sell it at $1.35 per thousand cubic feet, including the 25 cents you paid hitherto to government as a tax, in which case you would earn 10 per cent. more than the Sheffield Gas Company, allowing you all the differences of price of coal between New York and Sheffield. That my statement was right is shown by your silence.

Well, then, during the fiscal year ending 1871 you paid government tax—25 cents per 1000 cubic feet of gas—$584,526.99. You have therefore sold in round figures 2,338,104,000 cubic feet of gas, for which you charged $3 per 1000 cubic feet, and therefore received $7,014,312. These 2,338,104,000 feet of gas at $1.35 per 1000 cubic feet, inclusive of stamp, and which would leave you 10 per cent. more profit than the Sheffield Gas Company, amounts therefore to $3,156,440.60. The difference is your ill-gotten gain. And that difference is $3,857,872. How insignificant is, after all, the $1,250,000 of the woollen people's swindle on the city of New York, or the $500,000 of the iron people's swindle, or the 750,000 of the cotton people's swindle, compared with your feat of lighting the city with miserable gas, and lightening it of $3,857,872 yearly therefor. Come, most powerful, rich and influential sahibs, answer this third accusation; or are you in reality like the ancient idol Baal? Why don't you deny these facts? Why do you allow me to make these statements? Surely they are not calculated as a bow-down worship to you? Have all the Baals of three rich gas companies gone on their summer journey?

Be assured, dear sahibs, that this time no Baal worshipper has hold of you. Long and dire has been your reign, but the end is at hand. Just about a year ago, when a similar expose was made, it was the favorite comforting expression of one of the chiefs that it would all blow over. It did blow over, and all the swindlers were blown over with it. Take warning and don't let your case go by default.

I shall have the honor to address you again very soon. Until then I remain your very obedient servant,

ADERSEY CURIOSIBHOY.

Parsee merchant of Apollo street, Bombay.

Boiler Explosions.

By JAMES MCBRIDE.

[From the *American Artisan.*]

[Condensed by the Editor of this Journal.]

While the steam engine has advanced to great perfection both in the principles of construction and of working the steam to the greatest possible advantage, the boiler has, in a great measure, stood still. We find it to-day just where Oliver Evans and James Watt left it nearly one hundred years ago. Badly designed in the first place, and worse constructed in the second, it seems strange that engineers have not sooner taken upon themselves the task of improving it. Instead, however, of turning their attention to the boiler itself, and investigating the philosophy of its construction and the nature of the material of which it is made, they have loaded it down with self-registering gauges, lock up safety valves, low water indicators, high water indicators, floats, magnetic tell-tales, bells, gongs, whistles, and various other contrivances, until the important article—the boiler itself—has been entirely lost sight of. Each one of these devices has been recommended by its inventor as a sure preventive against explosion, yet scarcely a boiler explodes but has one or more attached to it. The majority of these instruments are simply used for indicating the height of the water in the boiler; but since it has been demonstrated by actual experiment that boilers will explode with a full supply of water, they become of but little value as safeguards; yet boiler users still continue voluntarily to use and re

commend them; and, worse than all, Congress has in some cases made it a matter of compulsion.

The engineer when he erects an iron bridge, makes provision for the expansion and contraction of its posts. A railroad engineer, in laying down his rails upon the ties, takes care to leave sufficient space between their ends to allow them to expand by the heat of the summer sun (nearly six feet to the mile). The engine builder puts expansion joints in the side-pipes of his engines and in steam pipes.

But what does the boiler maker do? Does he try to meet any of these difficulties? It seems not: he rivets up his work perfectly rigid, he bolts it and stay bolts it, and braces it in every conceivable way, as though he was fully determined to overcome the very laws that govern its nature; yet it will come and go with the ever-changing temperatures, despite all his bolts and braces, and, if it can not do this with a certain amount of freedom, it must to its own destruction.

There is no piece of machinery that is subject to such changes of temperature as a steam boiler; they extend all the way from zero to more than one thousand degrees Fah. There is no provision made for this great variation.

In many cases parts of it are under a severe strain, through defective workmanship in drawing the sheets together with the barbarous "drift-pin," which not only produces excessive strains, but also destroys the strength of the iron between the rivet-holes in the sheets, already weakened forty-four per cent. by the process of punching. It is now placed in its bed of brick-work, often in such a manner that the possibility of examining any of its parts except a portion of each end—a few sheets directly over the fire—is entirely removed. It is now subjected to all varying temperatures, from zero in freezing weather (when it is blown out on Saturday and allowed to stand until Monday), to over one thousand degrees, when by carelessness the water is allowed to get so low as to expose some of the surfaces. The bottom is exposed to a greater temperature than the top by being in direct contact with the fire and gases of combustion, and sometimes it is exposed to a less temperature than the top, by flooding in a large supply of cold feed-water. If there are any leaks about the seams of joints, they are in most cases hidden from view, and carry on unknown their process of destruction by oxidation.

Boilers, after being subjected to this treatment for a few years, or, perhaps, only for a few months, have their strength so far reduced that they cannot sustain the required pressure, and consequently must give way at their weakest part. That it will not take long to reduce them to this state of weakness is evident, when we consider that in their most perfect condition they will bear but little more pressure than that required in practice. While other engineers make their structures from ten to twenty times stronger than any pressure to which they are ever likely to be subjected, boiler makers do not give their work a margin of strength of more than two or three times that required; indeed, in many cases it falls far short of this.

To convey some idea of the immense strains thrown upon iron which is not free to expand as it is heated, I will give some data in regard to it:

The co-efficient of expansion for each degree of temperature between 32° and 212°, for good soft wrought iron such as is used in boiler plates, is ·000006614, which, multiplied by the number of degrees through which it is heated, will give its total elongation. And as the additional elongation of the one ten thousandth part of its length is equivalent to a strain of 2,240 lbs. per square inch of cross section, we have only to multiply this number (2,240) by the number of ten-thousandths that it is increased in length to get the total strain; or, in other words, the number of degrees through which the iron is heated, multiplied by the coefficient of elasticity (148·21 lbs.), will give the total strain per square inch of cross-section.

Water Meters.

The ingenuity of inventors has been tested to solve a very difficult problem, namely, the production of a cheap and accurate water meter, reliable under all the peculiar circumstances which would attend their general introduction and use. Several meters have been produced which sufficiently fulfil the requirements of the case to warrant their adoption. Two things retard their use.

The first is the unreason of the people at large, who fancy that, as they do not directly pay for water as they do for gas, it costs them nothing. "Free as water" has been said and sung so long that people think it would be a tremendous hardship to buy it by the gallon or cubic foot, and they would feel just the same if by reason of such a system their annual tax for water should be reduced fifty per cent. At present, those who consume and waste the least pay very much more in proportion to their consumption than those who use much and waste extravagantly. The burden is therefore very unequally distributed. The use of meters would correct this stage of things without materially increasing the cost of water to each consumer.

Another effect would be that the supply being husbanded in time of plenty, there would be enough on hand to spare in the dry season, and the almost annual restrictions enforced by water boards of large cities, and the often-recurring danger from fire through scarcity of water, would be obviated.

Be it understood we speak not of New York alone, but of all large cities that are beginning to outgrow their water supply.

The second thing that prevents the introduction of meters for water is the difficulty inventors find in dealing with corporations. The endless red-tape, the expense of dancing attendance around committee-rooms, and the cupidity of many officials, which induces them to look out for jobs and the best jobs, have retarded the use of meters more than any one may know who has not "been through the mill."—*Am. Artisan.*

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—ED.

Rejoinder to J. H. B.

ENGINEER'S OFFICE, GAS WORKS,
PORTLAND, ME., August 26, 1872.

Mr. Editor: I read in your Journal of the 2d inst., a communication signed "J. H. B." on the question of "Patent Rights." In your remarks you express a hope to hear from some of your readers in relation to the points at issue.

J. H. B. says: * * * * "A mistaken notion seems to exist in the minds of some of these inventors and patentees in relation to the claims of Mr. Gibson, viz., that it is for a particular mode of doing the particular thing, for which letters patent were granted to him in 1869. His claim essentially is, for a mode of making illuminating gas, by which the dip-pipe seal is dispensed with."

Now, Mr. Editor, the facts are these (and I do not think the parties will deny it), that Mr. Gibson was aware, in the early part of 1869, and several months before he applied for his patent, that there was a process in successful operation at the Portland, Me., gas works, by which the seal of the dip-pipes were dispensed with during the carbonizing process (the dip-pipes being sealed only during the time that the retorts are being drawn and re-charged).

Again—J. H. B. says: "Mr. Gibson successfully accomplished that which had never been done before."

Now, does not J. H. B. know very well that this same thing was accomplished more than five years ago, by a process far superior to the valve system, and has been in successful operation ever since, at the Washington, D. C., gas works.

But J. A. B. further says: "His (Gibson's) claim does not rest upon a mechanical device for an improvement in the manufacture of gas, * * * but upon the conception of an improvement * * * by which the cost of the product is reduced, etc.'

Now, Mr. Editor this is a little *too strong. His conception of this improvement.* On the 18th of June, 1867, George A. McIlhenny, of Washington, D. C., obtained letters patent of the United States, for a method of producing a vacuum in the retorts during the roasting process of the coal, in the manufacture of gas. In his specification is the following clause: "It is obvious that valves might be arranged to close the mouths of the pipes C, (the dip-pipes) when the retorts are to be opened, said valves being opened when the retorts are in operation, * * * but such an arrangement would be neither as simple nor as efficient as the one herein described.

Now, Mr. Gibson must have been aware of this clause in Mr. McIlhenny's specification, because he (Gibson) refers to it in his own specifications, dated more than two years afterwards; then how could it have been *his conception of an improvement.*

But J. H. B. intimates that the so-called Gibson valves are in successful operation at the Cambridge (Gibson's) Gas Works. Will J. H. B. please inform the readers of this Journal, if the Cambridge Gas Light Company have adopted these valves at their works, or whether they have been applied to two or three benches only (at Mr. Gibson's expense) for experimental purposes?

I intended to have referred to a communication in your last issue (September 2nd) over the signature of J. H. Blake, but will not take up more of your space at this time, only to say, that I agree with the quotations from Mr. Giles's pamphlet, in the statement, that "it will require much time, care and intelligence in operating these valves, and keeping them free from tar (and he might have added *pitch*), with which they become obstructed.

In your editorial remarks under J. H. Blake's communication, you invite figures of actual results obtained by experiment. I will comply by giving you my actual average results for the past two years, ending on the 30th of June last. And the process by which I am operating (I am informed) will be brought to the notice of the public through this Journal, in a short time.

Results at the Portland Gas Works, from July 1st, 1870, to July 1st, 1872. Coal carbonized, 8,169 tons, or 18,298,560 lbs. Gas sent out 91,286,000 cub. feet. Yield of gas per pound of coal, 4 98-100. Leakage not exceeding 8 per cent.

Any gentleman having doubts as to the correctness of these figures, can have the statement substantiated by addressing either the President or Secretary of this company. Very respectfully,

WILLIAM YORKE, Engineer.

Oxygen as a Stimulant.

M. Bert communicated to the French Academy, some curious experiments, from which we extract the following:

"Animals were next confined in superoxygenated air, the pressure of which was over 2½ atmospheres. Here an unforseen result was met with. When the pressure was raised to four or five atmospheres, the animal gave signs of suffering and fell into convulsions, which were repeated up to the time of its death (in less than half an hour). These violent effects could not be due simply to pressure, for in common air the animals bore a pressure of eight or nine atmospheres without inconvenience. They are due to the large proportion of oxygen, which, entering the blood, acted poisonously. To produce the same results by simply using air, it would be necessary to exceed 14 atmospheres. Oxygen, therefore, when its proportion in the blood is notably increased, acts as a poison.

"At a later period, M. Bert was able to apply a pressure of 20 atmospheres. With common air, the convulsions due to poisoning by oxygen appeared at 15 atmospheres.

"Still M. Bert thinks (and he gives proof of it) the injurious action of oxygen must not be supposed only to commence there. It begins to act thus at six atmospheres, or (as more refined experiment may yet show) at even lower pressures.

"The benefit derived from use of compressed air-baths, on the one hand, and many of the accidents that happen to workers in mines, in diving-bells, etc., on the other, appear to be due, in great part, to the introduction into the system of a quantity of oxygen greater than in the normal state; and it is with oxygen as with other poisons, small doses of which may be salutary.

"If aeronauts, who are stopped in their upward course, not by failure in the balloon, but by the im-

[*For continuation see page* 100.]

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AND

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WATER-SUPPLY, PATENTED INVENTIONS,
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☞ All communications to be addressed to "THE EDITOR, No. 42 Pine Street, Room 18, New York.

MONDAY, SEPTEMBER 16, 1872.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS*, or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

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TO OUR SUBSCRIBERS AND PATRONS.

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A NEW POPULAR WORK ON GAS.

The art of making permanent combustible gas from mineral coal, and of distributing the same throughout towns, is eminently and strictly one of the arts of the Nineteenth Century. Even among those almost prophetic writings of past ages which foreshadowed so astonishingly most of our great modern inventions, no hint appears justifying the belief that the Gas-Lighting Art was anticipated by the most enthusiastic imagination. Nevertheless it must be ranked among the greatest and most pregnant of human discoveries.

Nowhere, as we have before pointed out, in the civilized world, is this art of civilization, even now, so widely cultivated and availed of as in America; and nowhere is there so vast and so certain a future before it.

In view of these considerations, and the premonitions they must give rise to in the minds of thinking men, it has appeared to the Editor of this Journal that it would be a task acceptable to the American people, to place before them, in a condensed form, and in simple language, certain doctrines and principles relating to the nature of coal gas, which will be of help to them in understanding its properties; together with practical instructions in handling it, so as to develop to the full the benefits of this great gift of God to man

The undersigned has therefore had for some time in active preparation, and will soon have ready for the press, a work upon the Utilization of Gas for lighting, warming, cooking, kindling, motor, and other purposes, adapted for popular instruction on these subjects.

In this work, among other things, it will be shown that gas consumers, by making themselves acquainted with a few simple principles, may greatly increase their own comfort and that of their families, by obtaining from the gas they burn much more light of better quality; while attaining a certainty of no interruption or irregularity in the flow, occurrences which so often cause great annoyance and discomfort. It will be shown that by the substitution, to a large extent, for other fuel, for heating and cooking purposes, of gas, an amount of comfort and convevience, *combined with economy*, may be secured, which needs only to be known and comprehended by our people, to become a matter of universal adoption. It will also be shown that those fruitful causes of bickering and enmity between producers and consumers that now prevail, bringing often such undeserved odium upon the companies, may be effectually arrested:—this being secured by simple instructions which will enable every consumer of average intellect to keep track of his own consumption, both by reading his own meter, and in other ways. This will lead to the removal of the greatest drawback to the otherwise benignant operation of our present system of gas distribution.

The mutual benefits, *to both*, producer and consumer, that will so obviously and so copiously flow from the wide dissemination of this kind of information among the people, need little or no comment.

The result will quickly be so large an increase of gas-consumption, as to justify an important decrease in price. The gas-fraternity will find also that its present attitude of apparent antagonism to the public interests, will rapidly disappear, and a wide and increasing recoguition follow, of its true relations, as the custodian and trustee, earnest and faithful, of a grand and beneficent organ of civilization; and entitled, as such, to due consideration and regard.

The author therefore expects Gas Companies to co-operate with him in circulating this work *universally* among their consumers. A number of gentlemen high in the fraternity have already given their countenance strongly to the undertaking, and urge its immediate completion.

☞ Pecuniary profit is *not the motive* of this undertaking, and editions will be furnished of this work to Gas Companies at *very small cost*, such as will merely ensure against loss. It will consist of from forty to fifty pages, small octavo. *Special Editions* may be issued for any Company desiring a sufficient number, with any desired *additions* or *emendations*.

☞ *No advertisements* of Gas apparatus or fixtures of any kind will be admitted. Of course in this way much profit might be made, but it has been decided against by the author, for reasons which need no explanation.

☞ The assistance and co-operation of Mr. Magnus Ohren, the eminent British gas engineer, have been secured.

☞ The Work will be handsomely illustrated.

☞ The undersigned desires to correspond with members of the American Fraternity, regarding this undertaking, and to consider such hints and suggestions as may be vouchsafed to him. When the date of publication can be fixed on definitely, it will be at once announced.

HENRY WURTZ.

A PHENOMENON.

We have had occasion to complain of the fact that our big brother, the London *Journal of Gas-Lighting*, has always industriously ignored our existence heretofore. Not only does he refuse to take any notice of, or make any reply to, our requests to exchange, but not long since, in an enumeration of the various Gas-Light Journals published throughout the world, all mention of this Journal was ignominiously omitted. Certainly, therefore, the occurrence of a quotation from one of our editorials, even though inserted but scoffingly, may be regarded as sufficiently phenomenal to call for notice on our part, if not altogether titillating to our *amour propre*. Our allusion is to the following editorial remarks in his issue of July 16th.

To a certain extent under a cloud in the metropolis, the present gas referees have found an enthusiastic admirer on the other side of the Atlantic, to whose "unprejudiced and disinterested eyes" it appears that the referees are sacrificed to popular prejudices as represented by the Board of Trade. Our contemporary candidly admits that his "means of information are not expanded," as may be guessed from his remarks on the Board of Trade, "whatever that may be." "All we know of it," he says, "is that its chairman is Col. Hogg, and its principal gas regulator Mr. Runtz—*Arcades ambo* it may be;" and so on, with some remarks much more to the purpose than our contemporary is aware of.

If our admiration of the referees is enthusiastic, enthusiastic it must be, though we were really not aware of being in any way enthused on the subject. We tried to do them that justice which we thought probably withheld from them in their own country from motives of prejudice, partisanship, or jealousy. In a recent public lecture by Dr. Odling, we observe that he uses quite as strong words of approval regarding them as we have. Our enthusiasm, however seems not to be the only thing we were unaware of. Those must have been remarkable remarks of ours, which "were much more to the purpose" than we ourselves were "aware of." Our curiosity is naturally aroused, and the question occurs: if so, which? We wish "*our* contemporary" had been more explicit. Hereafter we surely ough

to write in fear and trembling, lest we may be constantly conveying something that we are not aware of, and from which our contemporary will distil some dread and mystic meaning, by ourselves unmeant.

Since the above was written, we have received, by favor of the gas referees, a "Supplementary Report" on the sulphur question, too late for further notice in this issue.

PERSONAL: INJUSTICE.

With much mortification we are obliged to admit that we have on several occasions lately, in our anxiety to do exact justice, unconsciously been guilty of its opposite. From the numerous learned and interesting scientific editorials that at present ornament the columns of our contemporary, the *Scientific American*, we have made repeated excerpts, and credited them them to Prof. Joy, who was at a former period an editorial contributor to that paper. For example, one article in particular, which, by reason of its extreme interest, and the deep research it exhibited, we copied in full, entitled "Anticipations of Modern Chemistry." (See issue of July 2, p. 7). Other shorter items, that come under the same category, are one on purifying carbonic acid with olive oil, Jan. 1; on sulphuretted alcohol, Apr. 16; on combustion of iron, June 17. All these, with possibly others that have escaped us, have been in reality from the fertile pen of that learned scientist, Dr. Van der Weyde, who besides editing in so masterly a manner the *Manufacturer and Builder*, is now also, it would appear, the scientific editor of the *Scientific American*.

ADDEREYES CURIOUS B'HOY.

For some two months we have waited for room to confer on our readers one (the third) of the vaporings of the "Parsee Merchant" with the sesquipedalian name; rescuing thus from oblivion a very striking array of figures (things which "cannot lie," you know). In one of his first outpourings he promised a *hundred and fifty* such letters as we present to-day! After this, therefore, we shall be obliged to await the appearance of the first fifty or sixty more, before we can promise to do anything further for him.

We are wholly ignorant whether Addereyes knows what we think of him, or whether he knows at all of the existence of a Journal, which furnishes the appropriate medium for public intercommunication with Gas Companies, and their officers, who cannot be expected to read all the newspapers in the land. Probably, however, as was observed by an eminent philosopher we read of in the pages of history, Mr. Toots, (who was much maligned and ridiculed by the late lamented Mr. Dickens):—"its of no consequence."

COAL GAS FOR CALORIFIC PURPOSES.

The paper by Mr. Hartley of Westminster, on "Cooking by Gas," which has been referred to by us on previous occasions, we at length find room for to-day, with the whole of the discussion thereon by the members of the British Association of Gas Managers. This paper, though on a subject of as great interest to gas men as any other that could be mentioned, can receive but scant notice from us to-day.

In the next issue some remarks in comment on Mr. Hartley's paper will be presented.

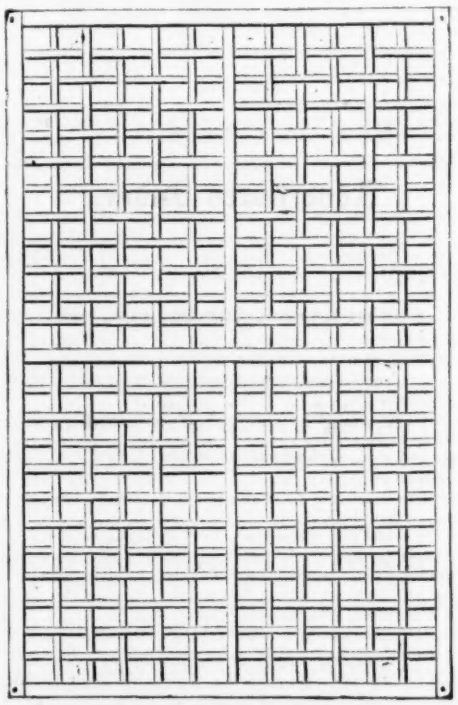
CHEAPER GAS.

In our last issue an announcement was inserted (not by the Editor) that the price of gas had been lowered 25 cents per thousand by three of our large New York Companies. The statement should have been accompanied by the reason of this action, which is simply the expiration of September 1st, of the term of the U. S. Government tax that has been imposed on gas to this amount. This reduction is one which should therefore be universal throughout the land.

SITUATION WANTED BY A COMPETENT AND energetic Gas Engineer, as Superintendent of Gas Works. Has had many years experience, and is thoroughly conversant with the management of gas accounts. Can produce testimonials as to capability. Address C. E. S., office of this Journal 305

AMERICAN

GAS SCREEN MAN'F'G COMPANY.



TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the Screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4te. Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

LUTHER DAY, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why they will not last for a long time. The *very large amount of open space* in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this fact of having *open Trays* would become more apparent to managers of gas works. The difference in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yours,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respectfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years' trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3, 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months, and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.,
SPRINGFIELD, MASS., Oct. 10, 1871.

MR. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable, and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them, being able to purify over fifty pet cent. more gas with them, than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISHOU.

Address **A. P. JAQUES, Treas.,**
Amer. Gas Screen Man'f'g Co., Haverhill, Mass.

CHARLES HUBBARD, JR.,

Consulting Engineer.

Steel and Iron Forgings, Light and Heavy Steel Castings to any pattern. Would call attention to his new article for Blacksmith's Forges, Jones's Patent Tuyere Iron, which is in successful operation in the leading establishments; can be used in any Forge now at work, or in combination with Jones's Improved Cast Iron Forge, plain or galvanized. Is prepared to furnish estimates of all kinds of Iron work used in the construction and carrying on of Gas Works, including supplies. Sole agents for A. L. Havens's Adjustable Automatic Dip Seal and Improved Retort Lids. Will give personal attention to the prompt execution of all orders. Address 60 Vesey Street, New York. 301

JAMES A. WHITNEY, late Editor of the *American Artisan*, and for four years past President of the New York Society of Practical Engineering, has opened an office as

Patent Agent, Expert in Patent Cases, and Mechanical Engineer,

AT NO. 128 BROADWAY, ROOM 11, NEW YORK CITY,

Mr. Whitney has had a practical experience of more than twelve years spent in pursuits directly connected with industrial operations and Patent Agency business, which will enable him to care for the interests of his patrons in the most satisfactory manner. 298

[*Continued from page* 97.]

possibility of living, wished to soar higher, they might accomplish this if they took with them a supply of oxygen to which they could have recourse when the air became too rare. The mechanical arrangements for breathing this conveniently can be easily conceived.

"On the other hand, the industries which subject workmen to pressures over five or six atmospheres, entail suffering and death; which evils might be remedied if there were substituted for the air a mixture of air and nitrogen, calculated so that the pressure of the oxygen should not exceed a certain low limit."

Fusion and Congelation of Fats.

The melting point was determined as usual by a film of the fat on the inside of thin tubes, immersing these in water, and gradually raising the temperature, noting by means of a thermometer the temperature at which the film disappeared. The results were sometimes found to vary a few degrees with the same fat tried at the same time. The congealing point was tried by melting the fats, and then allowing them slowly to congeal, while shaking them, noting the temperature by means of a thermometer introduced into them. The thermometer column usually descended slowly to a certain point, then remained stationary for some time, during which time, congelation was evidently going on, and then again descended. The point where the thermometer remained for some time stationary was considered as the congealing point. With the glycerides the temperature sank to a certain point, and then rose a few degrees. The results are tabulated as follows:

	Melts.	Congeals.	Temperature rises on c'l'g to
Yellow beeswax	63·4°	(61·5° 62·6° (62·3°	
White wax	61·8	61·6	
Paraffine	(49·6 52·5 to 54° 53° 52·7 to 53·2	(46·6 53·0 52·9 52·7	
Spermaceti	(43·5 44·1 to 44·1 (55·3	(43·4 44·2 (55·2	
Stearic acid	56·2 to 56·6 (56° to 56·4	55·8 (55·7	
Japan wax	50·4 to 51°		50·8
Cacao butter	33·5		27·3
Muscat butter	70 to 80		41·7 to 41·8
Mutton tallow	46·5 to 57·4	32 to 36)	some degs.
Beef tallow	43·5 to 45°	27 to 35)	

Experiments were made on mixtures of fats which generally showed lower congealing points than that of either of the constituents.—*Rudorff—Am Chemist.*

RECENT AMERICAN PATENTS.

Pertaining to the Specialties of this Journal, to date ending August 24, 1862.

128,190.—Apparatus for manufacture of gas from oils.—C. and F. A. Gearing.

127,973.—Screen for coal gas purifier.—J. Hale.

127,965.—Air tight joint for gas retort.—Dietrich and Schussler.

128,004.—Gas and air heating oven.—G. F. Wilson.

128,091.—Water elevator.—N. Adams.

128,336.—Gas pipe connection.—W. B. S. Taylor.

128,321.—Manufacture of illuminating gas.—H. B. Myer.

128,914.—Apparatus for burning hydrocarbons as fuel.—W. H. Russell.

128,918.—Manufacture of illuminating *gas*.—W. H. Spencer.

129,158.—Chimney holder for gas burners.—George Mooney.

128,506.—Carbureter.—J. B. Hyde.

129,723.—Condensing apparatus for gas works.—H. H. Edgerton.

119,853.—Machine for tapping water and gas mains.—H. Mueller.

129,720.—Manufacture of illuminating gas.—Lieterich and Schussler.

4,998.—Purifying illuminating gas.—R. J. Everet (reissue).

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[Reported Expressly for this Journal.]

SEPTEMBER 16, 1872

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Kirkless Hall	13 00	@	13 50

English Caking Coals.

Newcastle Gas	$7 50	@	8 00
Liverpool caking	7 25	@	7 50

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International—At Mines, $2 00 in currency			— —
Block House—At Mines, $1 50, Gold			6 25
Little Glace Bay—At Mines, 1 60 Gold			— —

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Westmoreland	6 75	@	0 10
Shafton	6 00	@	0 00
Youghiogheny—At Baltimore	5 50	@	0 00

West Virginia Coals.

MurphyRun	$6 75	@	0 00
Despard	6 75	@	0 00
West Fairmont	6 87½	@	7 00
American Gas Coal	6 62½	@	6 75
Fairmont	6 75	@	0 00
Newburgh Orrel	6 75	@	0 00
Pinnickinick	6 75	@	0 00
Cloverhill of Virginia	5 25	@	5 50
McKenzie Compound Mixture			8 00

American Cannel Coals.

Peytona of West Virginia	$14 00	@	14 50
Darlington of Pennsylvania			— —
American Cannel	$10 00	@	10 00

Asphalts.

Albertite of New Brunswick	$18 00	@	18 00
Ritchie Mineral of West Virginia	17 10	@	00 00
Trinidad Bitumen	— —	@	14 05

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American Meter Co.—West 22nd st., N. Y., Arch and 22d st., Phil., 23 West st., Boston 6
Agency for the Gibson Improvement—W. H. Grenelle, 41 Pine street, N. Y. 9
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Cast Iron Gas and Water Pipe—Henry G. Nichols, 14 Platt street, New York 5
Cast Iron Gas and Water Pipe—Jno. McNeal & Sons, 117 Broadway, N. Y. 2
Gas-Burners—C. Gefrorer, 259 Commerce st., Philadelphia, Pa 6
Gas Purification—St. John and Cartwright 6
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry st., Philadelphia, Pa 6
Gasometers, Etc.—Geo. Stacey & Co., Cincinnati, O 3
Gas Fixtures, Etc.—Mitchell, Vance & Co., 597 Broadway 4
Gasholders, Etc.—Deily & Fowler, 39 Laurel st., Philadel. 4
Gas and Water Pipes—B. S. Benson & Son, Allentown, Pa. 5
Gasometers, &c.—Keystone Iron Works—2132 Filbert st., Philadelphia 4
Gas Screens—American Gas Screen Manufacturing Co., Haverhill, Mass 1
Jersey City Gas Meter Works, 14 Morris st., Jersey, N. J. 3
Northwestern Gas and Water Pipe Co.—646 Wabash Ave., Chicago, Ill 7
Patent Conically Slotted Wood Trays—John L. Cheesman, 147 and 149 Avenue C., N. Y. 5
Patent Gas Exhauster—Smith & Sayre, 95 Liberty stfreet 9
The Gas Light Co. of America—Box 5220, New York city 4

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Despard Coal Co.—Parmelee & Bros., Agents, 32 Pine st., N. Y 4
Gas Coals—Bird, Perkins & Job, 86 South st., N. Y 5
Grahamite or Ritchie Mineral—27 South Charles street, Baltimore, Md 8
Ohio Gas Cannel—George Merryweather, 5½ Pine street, New York 3
The Newburg Orrel Coal Company—Chas. W. Hays, Agent in New York, Trinidad Building, 111 B'way, Room 7 5

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Providence Steam and Gas Pipe Co., Providence, R. I.—H. A. Branch, Agent 4

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Laclede Fire Brick Works, 107 North Levee, St. Louis, Mo. 8
Manhattan Clay Retort Works, 15th st., near Av. C, N. Y. 8
Philadelphia Fire Brick Works, Vine and 23d sts., Phila. 8
Retorts, Etc.—Geo. C. Hicks & Co., Baltimore Md 6

LAMPS, STOVES, PETROLEUM, ETC.

Patent Lamp Post—J. W. Graham, Chillicothe, Ohio, or A. M. Callender, office of this Journal 9

MISCELLANEOUS.

Architect and General Gas Engineer—William Farmer, 111 Broadway Room 91 3
A Synopsis of British Gas Lighting—Jas. R. Smedberg, San Francisco, Cal 4
American Journal of Science and Arts—Silliman and Dana, New Haven Conn 7
Contractors for Gas Works, Etc.—Murray & Baker, Fort Wayne, Ind 5
Fodell's System of Bookeeping—A. M. Callender & Co., 42 Pine st., New York 8
Journal of the Franklin Institute—Prof. W. H. Wahl, Franklin Inst., Phila,, Pa 4
On the Advantages of Gas for Cooking and Heating—Magnus Ohren, Lower Sydenham, London, S. E 5
School of Mines, Columbia College, East 49th st 5
Scientific and Chemical Expert—Prof. H. Wurtz, 26 Pine street, room 36, N. Y 7
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Works upon Gas—D. Van Nostrand, 23 Murray street and 27 Warren street, N. Y 9

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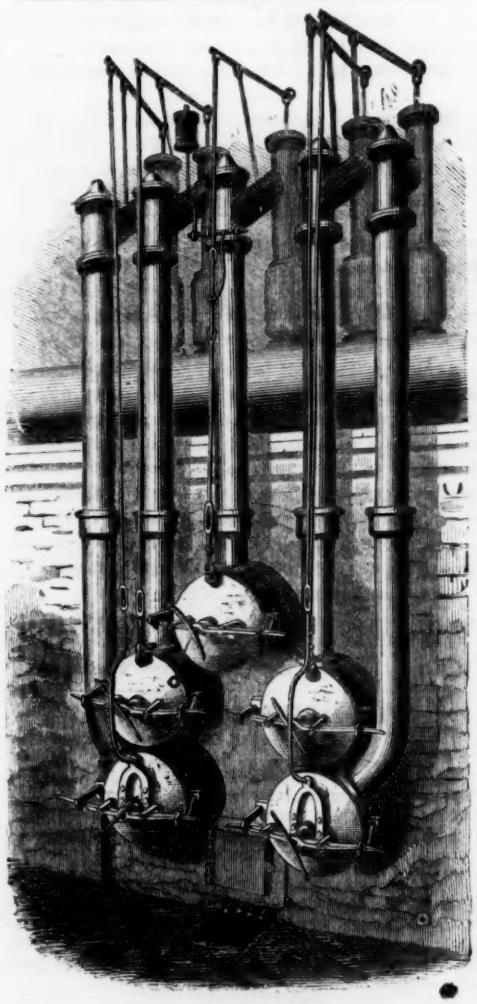

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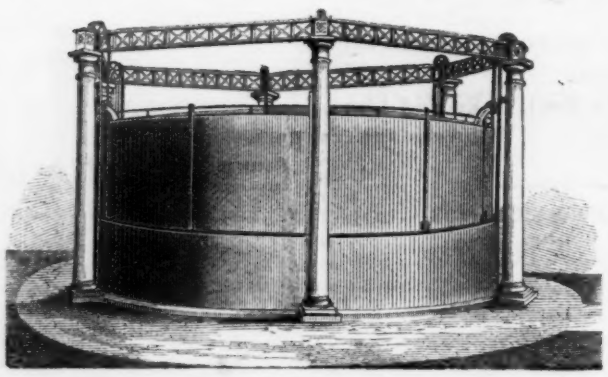

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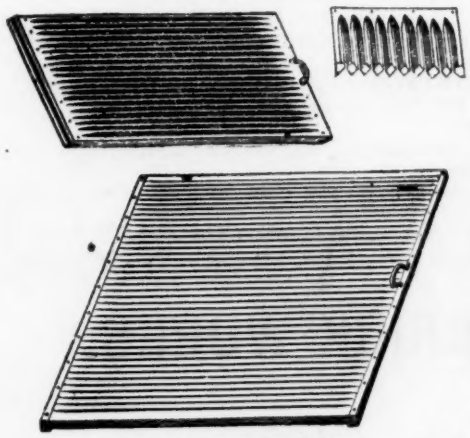

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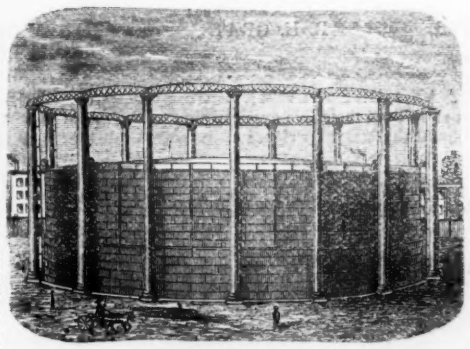

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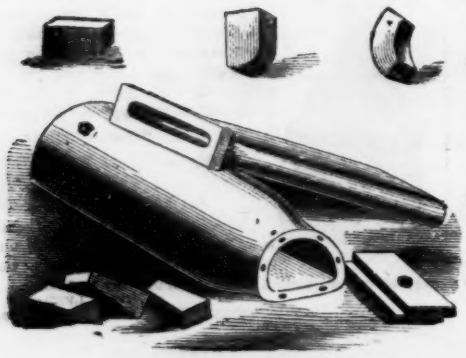

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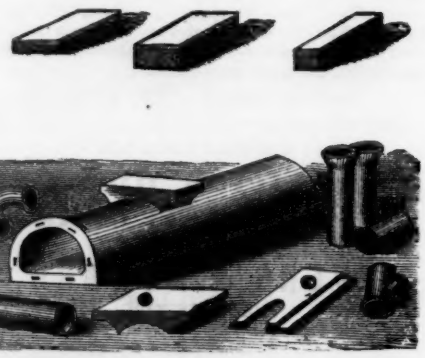

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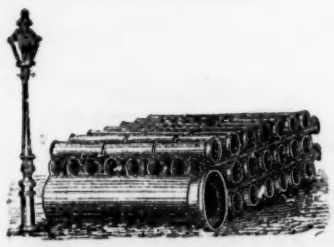

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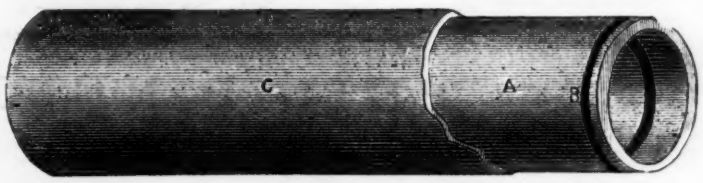

FIG. 2.

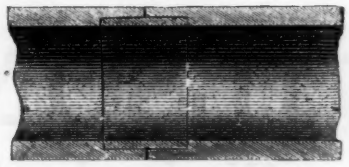

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3.—Horizontal Section and Connection.

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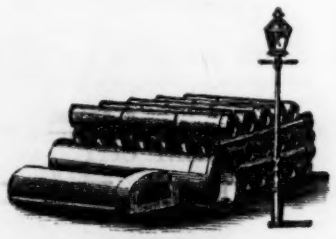

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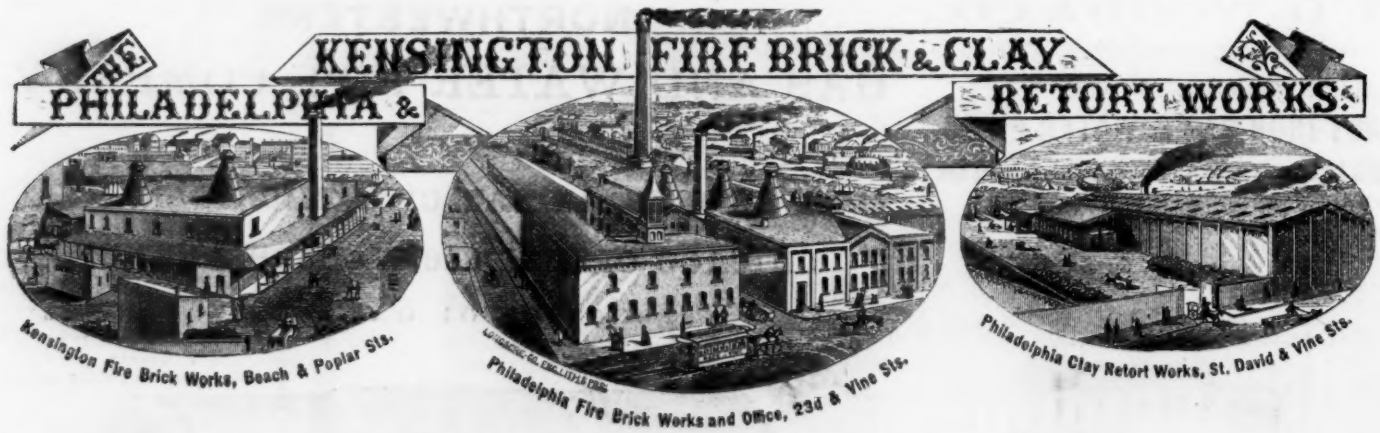
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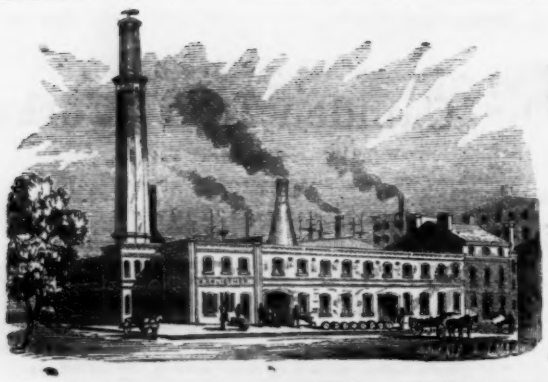

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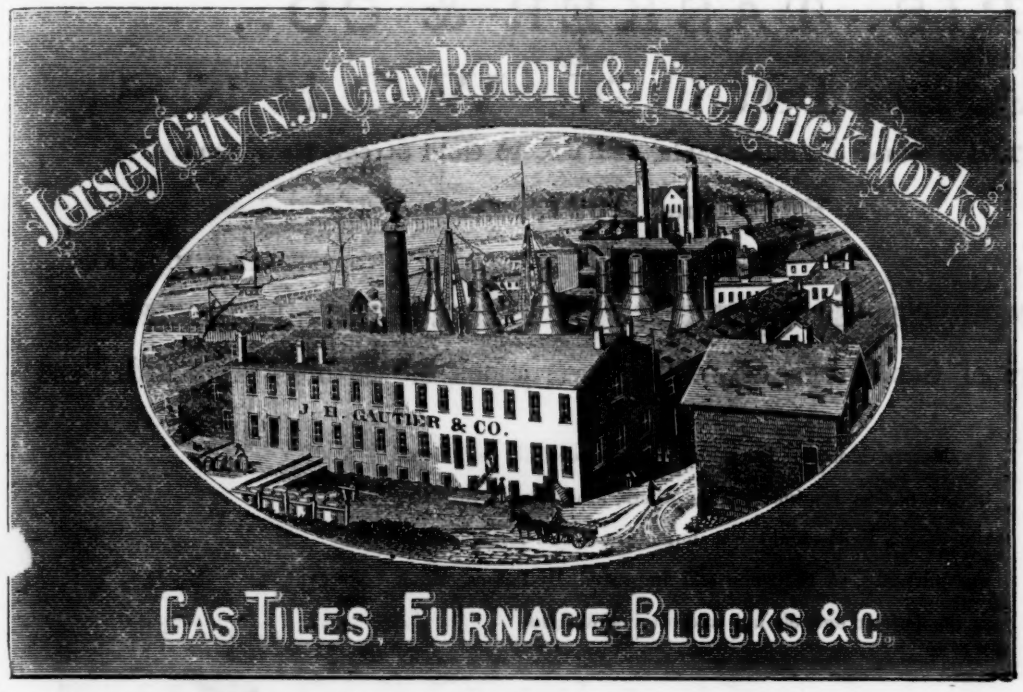

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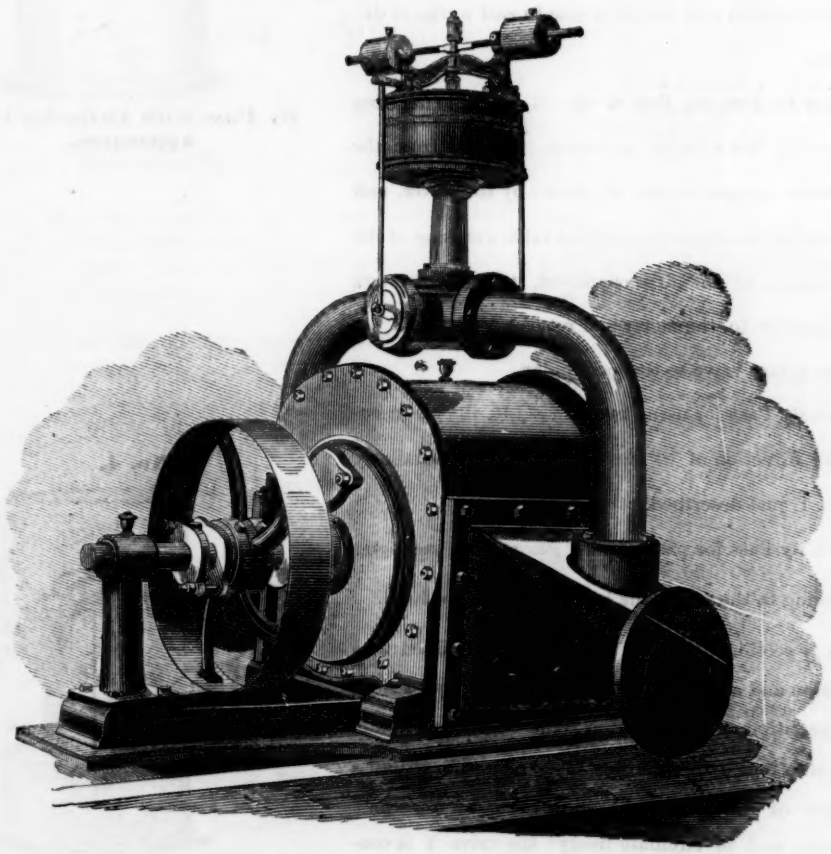

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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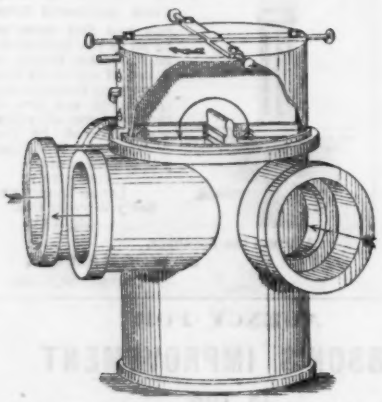

By Pass with Drip for Single Apparatus.

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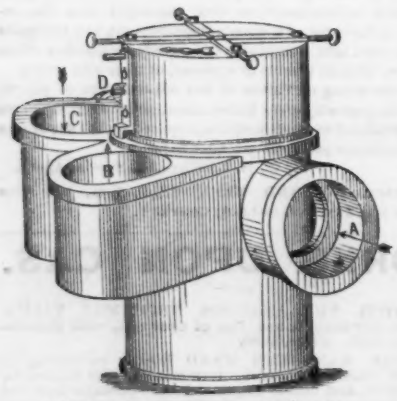

Meter By Pass with Drip.

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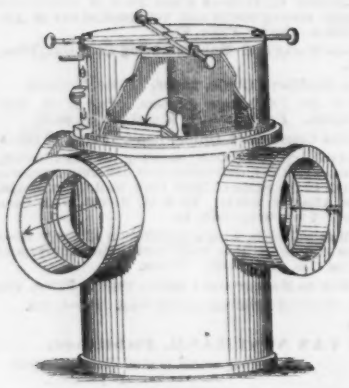

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No. 1 is a By-Pass for Gas Works of small generating power, and using but a single apparatus; the gas from the retorts enters the proper nozzle, as shown by the arrow, and being deflected by the diaphragm of the valve over one of the vertical partitions of the drip chambers, it passes through one of the nozzles to the meter and returns to be again deflected by the rotary valve to the gas holder.

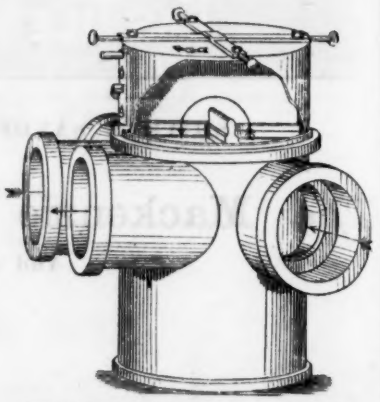
No. 2 is a By-Pass for using two apparatus, the gas is entered and the direction of its current is controlled similarly to that of No. 1, just described.

No. 3 is a By-Pass for passing the gas around the meter or not, according to the set of the loose or circular valve.

No. 4 is a sectional view of No. 3, and fully illustrates the construction and arrangement of the various By-Passes; the vertical partitions P are placed at right angles and divide the By-Pass into four drip chambers, they extend to within a short distance of the bottom to allow the water W, which forms the water seal, to circulate freely; the valve V is constructed with a diaphragm which divides it diametrically, the edges from ground joints with the upper edges of the partitions P, to prevent the gas from leaking from one chamber to another, and also to protect the ground surfaces from the corrosive action of the gas.

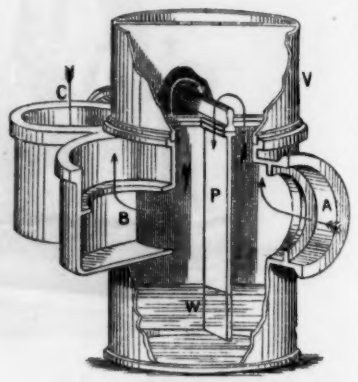
No. 5 is a single By-Pass with Drip Chambers.

No. 2.



By Pass with Drips for two Apparatus.

No. 4.



Section of No. 3.